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The validity of Okun's Law: Evidences from Indian economy

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Abstract. *Unemployment is one of the most prominent issues being faced by developing countries especially India. Unemployment means productive resources not being utilized at all, which results low growth rate in real GDP. In macroeconomic terminology this relationship is called as Okun's Law. The main aim of this paper is to examine whether there exists an Okun type relationship in Indian economy or not. Empirical result shows negative and significant effect of growth upon unemployment rate. Our model suggests that 1% increase in GDP will decrease unemployment rate by 0.4 percentage point.*

Keywords: unemployment, GDP, Okun, Co-integration, casual relationship.

JEL Classification: E24, F43.

Introduction

Indian economy is the 6th largest economy in world with nominal GDP of USD 2.9 trillion and will overtake UK by 2020 to become 5th largest economy. India is fastest growing large economy after China, with numerous resources and favorable demographic dividend. It remains a challenge for Indian economy to take the advantage of this dividend. If we have a look on employment figures, we can see that unemployment rate is decreasing from 6.2% in 2014 to 2.3% in 2016 in India. The relationship between these two variables was first studied and estimated by Okun in 1962, which was commonly known as Okun's Law. Okun law states that there is negative relationship between GDP growth rate and unemployment rate, which is an important concept in macroeconomics both theoretically and empirically. Theoretically, Okun's law is the link between the aggregate supply curve and labour employment. Empirically, Okun's coefficient is a useful "rule of thumb" in forecasting and policymaking Harris and Silverstone (2001). Because Okun law drew the conclusion that unemployment rate was reduced about 0.3% points for every percentage point of GDP growth rate. This law intends to tell us how much of output we can lose if the unemployment rate is above its natural rate (potential level of output). This relationship was studied and examined by number of researchers. Some of them support Okun's law and some opposed this law. First we will examine those, who supported this law are Dornbusch et al. (2001). Who supported the existence of Okun's law and argued that foregone output is the major cost of unemployment. Zonzilos (2000) has also examined the Okun's law in Greece from time series data over the period 1965-1999 and found that unemployment decrease by 0.28 percent, if aggregate output increases by 1 percent. Noor et al. (2007) also examined whether there exist an Okun law in Malaysian economy or not. The empirical results showed the existence of inverse relationship between output and unemployment in Malaysia.

Bankole and Fatai (2013) studies the validity of Okun's law in Nigeria and estimated Okun's coefficient by using the annual data from 1980-2008. By using Engle Granger co-integration test, the empirical evidences showed Okun's coefficient is positive and is not applicable in case of Nigeria.

Data and methodology

The present study is based on the annual time series data over the period from 1983 to 2013 and has been collected from Reserve bank of India (RBI), NSSO data, statistical bulletin and Ministry of labour and Employment. The econometric methods were used to analyze the Indian unemployment and Gross domestic Product and to analyses the casual relationship between these variables.

Econometric methodology

The objective of this section is to test and estimate casual relationship between GDP and unemployment in the case of Indian Economy over the period of 1983-2013 and to verify the validity of Okun's Law, our model will be:

$$UNMt = \alpha + \beta GDP + \varepsilon \quad (1)$$

Where GDP is Gross Domestic Product in India and UNM is unemployment rate in India while α and β are the coefficient to be estimated and the ε is error term.

To ensure the linearity of variables, we have used the converted form of equation (1) which is given below, where "ln" standing for the natural logarithm.

$$\text{InUNM} = \alpha + \beta \text{lnGDP} + \varepsilon \quad (2)$$

For validity and verification of the model shown in eq. 2 has to pass through different steps as follows:

Step 1

To check whether the time series data of GDP and unemployment data are stationary or not. For this we have the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test of unit root. The null hypothesis in ADF test is that the time series data series is not stationary, or there exists a unit root, while the alterative hypothesis is that the series are stationary.

There are two cases used to show the existence of unit-root test:

1. with intercept

$$\Delta X_t = \alpha + \delta X_{t-1} + u_t \quad (3)$$

2. with intercept and trend

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + u_t \quad (4)$$

Step 2

Next step is to test for co-integration and to verify whether the two series are co-integrated or not. For this purpose Johansen-Juselius technique was employed to test the existence of co-integration relationship between GDP and unemployment rate. The procedure depends on the Trace test and Maximum Eigenvalues test. In order to determine the number of co-integration equations between these variables. Accordingly the null hypothesis is (R = 0) there is no co-integration equations and alternatives one (R≤1) that there is existence of at least on co-integration equation.

Step 3

The Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Co integration tests is sensitive for the number of lags used in the model. The optimal lag length for the model selected on the basis of Schwarz Information Criterion (SIC) criteria.

Step 4

After following the above steps, finally Vector Error Correction was employed to determine the casual relationship between inflation and unemployment. The methodology is adopted in line with Noor et al.(2007) and Khaliq et al. (2014).

Result and discussion

In order to obtain the desired results, we need to make sure that our model should be free from "spurious regression" (Gujarati 1995). First we test the order of integration for each variable using Augmented Dickey-Fuller Test (ADF) and Phillips-Perron (PP). The results of both the tests are reported in Table 1. With critical values both in intercept and intercept with trend. The empirical results suggest to reject the null hypothesis of no unit root. Accordingly, we accept that GDP is stationary on both at level as well as on first difference, while as unemployment has unit root problem at I(0) and is stationary on first difference.

Table 1. *Unit root tests result Augmented Dickey-fuller (ADF)*

Series	Intercept		Intercept with trend	
	ADF	PP	ADF	PP
LGDP	-4.093200 (-2.967767)*	-4.044684 (-2.967767)*	-4.421923 (-3.574244)*	-4.547020 (-3.574244)*
LUNM	-2.168123 (-2.967767)	-2.207717 (-2.967767)	-3.292831 (-3.574244)	-3.374622 (-3.574244)
DLGDP	-8.040722 (-2.971853)*	-15.86980 (-2.971853)*	-7.964546 (-3.580623)*	-18.93573 (-3.580623)*
DLUNM	-5.760033 (-2.971853)*	-9.382447 (-2.971853)*	-5.638339 (-3.580623)*	-9.272290 (-3.580623)*

From Table 2, the result of co-integration is shown. Accordingly we reject the null hypothesis of no co integration between the variables at 1% level of significance, because estimated values are more than the critical values. The long run co-integration is occurring in between GDP and UNM and is confirmed based on the results suggested by Durbin Watson statistics and F-statistics, and are significant at 5% level.

Table 2. *Result of the F-test for Co-integration*

Hypothesis	Trace Statistic	Max-Eigen Statistic
None (R=0)	991.2854 (15.49471) [0.0001]	989.8142 (14.26460) [0.0001]
At most 1	1.471223 (3.841466) [0.2252]	1.471223 (3.841466) [0.2252]

R^2 = 0.49, Adjusted R^2 = 0.45, Durbin Watson Stat 1.926622, F-Statistic = 9.364973, Prob F-stat 0.004837.

Table 3 reports the Okun's elasticity coefficient and also shows the impact of change in GDP which is negative and have significant at 1% level, which means that 1% increase in GDP leads to decrease in unemployment rate by 0.47%. This is much below the than the coefficient found in Okun's original work. The result is consistent with Noor et al. (2007), Khaliq et al. (2014), Haris and Silverstone (2001).

Table 3. *Result of long run elasticities of Okun's Law in India*

	Constant	GDP
UNM	1.05 (0.0048)	-0.47* (0.0000)

Table 4 examines the short run and long run Granger causality with the Error-Correction Mechanism (ECM). Thus long run relationship was not confirmed between unemployment rate and GDP in India, because the error coefficient term is (ECT_{t-1}) Positive and have significant at 5% level of significance. For long run causality relationship error correction mechanism should be negative. This confirms that there is no long run Ganger Causality between unemployment and GDP rate in India. However short run causality relationship was found and has been confirmed by Walt test. The F-Statistics critical values at 1 percent level of significance, which give us clear indication of short run causal effect. Therefore the finding of this paper reconfirms the existence of Okun's law in Indian economy.

Table 4. *Result of Granger causality*

Dependent Variable: ΔUNM				
$\Delta(UNM)t = b_1 + \sum_{i=1}^{n} b_{2i}\,\Delta(UNMt-i) + \sum_{i=1}^{n} b_{3i}\,\Delta(GDPt-i) + b_4 ECT_{t-1} + \varepsilon$				
	Coefficient	Std. Error	t-Statistic	Prob.
ECT_{t-1}	0.782356	0.165995	4.713126	0.0000
Wald Test:				
Test Statistic	Value	Probability		
Chi-square	8.313231	0.0039		
F-Statistic	9.364973	0.0048		

Conclusion

Now we are in a position to answer the question "Validity of Okun's law". Yes it is valid and is applicable for Indian Economy. Planners have to keep this thing in mind while framing employment policies in the country. Any attempt of the government to increase the GDP rate will definitely reduce the unemployment in India and vice versa. However, increase in GDP will not be the alone solution for unemployment. In addition of GDP, there are many other factors as well which are to be taken into consideration for reducing unemployment, like creating new jobs, job seekers talent and skill, incentives, labour intensive techniques, high tech production capabilities etc.

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