Does There Exist Okun's Law in Pakistan?

Khalil Ahmad[1]
Assistant Professor
Economics Department
University of the Punjab, Lahore, Pakistan

Sumaira Khalil
Student of PGDAE
Economics Department
University of the Punjab, Lahore, Pakistan

Allah Ditta Saeed
Assistant Professor
Economics Department
University of the Punjab, Lahore, Pakistan

Abstract

This study tests the relevance of Okun's law to Pakistan economy. For this purpose, two versions of Okun's law —'the difference' version and 'the gap' version — were tried using annual time series data on growth rate of gross domestic product and unemployment for the period from 1974 to 2009. As the variables included in both the models were stationary at the level, the ordinary least squares method was employed to extract the coefficient of Okun's law. Neither of the models witnessed existence of Okun's law to Pakistan Economy. The study recommends further research on the issue incorporating the possible interaction between inflation and unemployment. Further, government agencies collecting and maintaining socio-economic data should make utmost effort to collect and publish accurate and reliable data in Pakistan.

Key words: Okun's Law; 'the Difference Model'; 'the Gap Model'; Pakistan; GDP; Unemployment

Introduction

Variations in unemployment are inversely related to variations in output in any economy. This relationship was discovered and empirically estimated for the first time by Okun (1962). This relation is named after its founder as Okun's law and has been a hot subject under study in Economics literature. However, like all other laws of Economics, Okun's law is not an exact relationship between variations in unemployment and output. It varies not only with respect to countries only but also with respect to time for a given country. Okun's law relates variations in output to variations in unemployment. When recession hit an economy it not only reduces produced output but also leads to laying off previously employed workers. On the other hand, when an economy recovers from a recession it not only starts producing more output but also hires previously unemployed workers. Okun's initial estimates revealed an approximate relation of 3 to 1 percent i. e. 1 percentage point increase in unemployment led to 3 percentage points fall in output. However, estimates of later studies using modern data and advanced econometric techniques show a 2 to 1 percent relationship between percentage variations in output and unemployment [Samuelson and Nordhaus, 1995].

The negative relationship between output gap and unemployment empirically estimated as Okun's law is an essential ingredient of any macroeconomic model because aggregate supply curve is derived by combining Okun's law and the Phillip's curve. This relationship is of special interest for policy makers. They are interested in knowing as what percent growth of output is required to reduce unemployment by one percentage points? In addition, the effectiveness of disinflation policy depends on the responsiveness of unemployment to changes in output. In developing countries such as Pakistan, the unemployment rates are soaring high. This situation calls for policies aiming the reduction in employment rates. It is only possible through study of the relationship of unemployment to other variables like output growth, money supply, inflation and other such related variables. Unemployment causes a number of costs not only to the unemployed and his family but also to the society as well.

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[1] Correspondence author.

Higher unemployment fractions mean that our current output is much lower than the potential output and it results in loss of output. Unemployment has a transitivity property i.e. when unemployed workers cut down their spending it reduces demand for output which in turn causes unemployment for other workers. High unemployment rates lead to increased government expenditures on unemployment compensation. This situation by increasing budget deficit leads to higher inflation which further accentuates sufferings of the unemployed. The workers remaining unemployed for longer periods are compelled to join the underworld and commit crimes like murdering, committing dacoity , theft, violence drug abuse and suicide. In view of the high economic and social costs of unemployment, the economic researchers have been interested in measuring various dimensions of unemployment problems. One stride of unemployment is related to the association between output gap and unemployment gap i.e. the Okun's law. The aim of this study is to estimate Okun's coefficient so that appropriate policies be devised and unemployment rate could be brought down to its natural rate.

Review of Previous Studies

Sheehan and Zahn (1980) estimated variability of Okun's coefficient and found that the changes in labor productivity and in weekly average hours are the two significant factors causing this variability. Prachowny (1993) revised the estimates of Okun's law for U. S. economy and found that one percentage point decline in unemployment rate is accompanied by 2/3 percentage rise in output. He further found that impact of changes in weekly work hours had independent impact on output gap. Weber (1997) relates Okun's law as a relationship between output gap and unemployment to business cycle. Nourzad and Almaghrbi (1996) observed that exclusion of expectations in the Okun's model undervalue the relationship between output growth and fall in unemployment. Attfield and Silverstone (1998) estimated the long run relationship between output and unemployment gaps using the cointegration methodology and found that the approximate vale of Okun's coefficient was -2.25 for the U. S. economy.

Freeman (2000) calls Okun's law 'a rule of thumb' which provides rough guideline to policy makers concerning the relationship between output changes and unemployment changes.Söegner and Stiassny (2002) tested Okun's law and claimed a negative association between the unemployment rate and the real output (GDP). Apergis and Rezitis (2003) estimated Okun's coefficient for some regional areas of Greece for the period 1960-1997. Their analysis revealed no differences in the region except for Epirus and North Aegean Islands. Further, it was noted that Okun's coefficient underwent substantial changes 1981. For the later period unemployment became less responsive to output changes in all the regional areas. *Aoki and Yoshikawa* (2003) found that the magnitude of the relationship between unemployment and GDP is larger than Okun's original estimates if the average GDP rises. Stockhammer (2004) analyzed alternative regimes of profit-led demand and wage-led demand leading to growth by closing the model with Okun's law. He found that under profit led regime short run and long run equilibrium rates of unemployment were stable. However, under wage led demand regime there was no possibility of long run equilibrium rate of unemployment.

Silvapulle *et al* (2004) observed that there had been an asymmetric relation between output and unemployment. They used a dynamic model which permitted asymmetry in the relationship between unemployment and output to explain the Okun's coefficient. Perman and Tavera (2005) examined the convergence of Okun's Law coefficient in several alternative groupings of European countries. They found convergence in this coefficient among northern European countries and in countries having central wage bargaining. But they could not find existence of convergence in other country groups. Villaverde and Maza (2008) analyzed Okun's law for Spanish regions using data for the period 1980-2004. The results verified the existence of Okun's law for most of the regions and for the economy as a whole. However, the magnitude of Okun's coefficient differed for various regions due to regional productivity differentials.

Malley and Molana (2008) showed that labour productivity is affected by imperfections of goods and labour markets. Their estimates of threshold unemployment, which separates 'high-effort' and 'low-effort' states, are positive for G7 countries except Germany which tended to be persistently in the former state. Pierdzioch *et al* (2009) used data covering the period 1989-2007 for G7 countries test relevance of Okun's law to professional economist's forecasts of output growth and unemployment. Their results confirmed the consistency between Okun's law and professional economists' forecasts of changes in unemployment rate and the real output growth rate. They also found a direct relationship between magnitude of unemployment and the size of the output gap.

GDP and Unemployment Profile of Pakistan

Growth rate of GDP and unemployment rates in Pakistan have been highly volatile. Table 1 contains figures of GDP growth and unemployment rates for the last 36 years. Although Pakistan has achieved a respectable growth rate of 5.11 percent over the last 36 years, its growth rate in different time periods has not been smooth. It achieved the highest growth rate of 8.71 percent in 1985 and the lowest growth rate of 1.7 percent in 2009.

Insert Table 1 about here

Figure 1 shows that 1980s has been the decade of highest growth in Pakistan whereas 1990s is known as the lost decade in Pakistan with respect to growth rate. The last decade in Pakistan shows a growth trend similar to inverted 'V' letter. Table 1 also contains figures of unemployment rate in Pakistan during the last 36 years. According to Tables 1 unemployment rate has been the lowest (1.7 percent) in the year 1975 and the highest rate in the years 2002 and 2003. The average rate of unemployment in Pakistan during the last 36 years has been 4.91. A look on Figure 2 reveals that unemployment rate in Pakistan has not only been volatile, it has also increased over time. In the mid 1970s it was lower than 2 percent and rose to over 8 percent in the start of 2000s decade. The rising trend of unemployment shows that the economy has failed to generate job opportunities in proportion to increase in labour force.

Insert Figure 1 about here

Insert Figure 2 about here

Methodology and sources of Data

Sources of Data

The estimation of Okun's law entails data for unemployment and gross domestic product GDP for Pakistan. The data on GDP and unemployment were taken from various issues of *Pakistan Economic Survey* and *Pakistan Labour Force Survey*. The study covers the time period from 1974 to 2009. The data on GDP was used on constant factor costs of 1980-81.

The Model

In economic literature Okun's law has two alternative specifications, namely the 'first difference model' and the 'gap model'. The former is specified as:

$$Y_t - Y_{t-1} = \beta (U_t - U_{t-1}) + \varepsilon_t \tag{1}$$

Where:

Y_t = Natural logarithm of GDP in current time period

　　Y_{t-1} = Natural logarithm of GDP in the previous time period

　　U_t = Percentage rate of unemployment in the current time period

　　U_{t-1} = Percentage rate of unemployment in the previous time period

　　ε_t = Random error term in the current time period

The latter version of the Okun's law i.e. the gap measure is given as:

$$Y_t - Y_t^* = \beta (U_t - U_t^*) + \varepsilon_t \tag{2}$$

Where:

　　Y_t^* = Potential level of output in the current time period

U_t^* = Natural rate of unemployment in the current time period

and other variables are as defined under (1) above.

The calculation of potential output requires the data series on capital stock which is not available in published document, therefore, in this study, the estimated values of output resulting from regression of output against time was taken as potential output. Similar line of reasoning was used in case of natural rate of unemployment. The deviation of actual output from potential output reflects the strength of business fluctuation accompanied by deviation of actual unemployment from its natural level.

Estimation and Interpretation of Results

As this study involves time series data on GDP growth and unemployment rate in Pakistan, the ordinary least squares (OLS) method cannot be applied for estimation unless it is established that the variables concerned are stationary. Therefore, we have applied unit root test to check the stationarity of GDP growth rate and unemployment rate.

Unit Root Test

Phillips-Perron (1988) test was used to test the stationarity of GDP growth and unemployment rate. This test is very appropriate while analyzing time series when differences of the variables may follow mixed ARMA (p, q) processes of unknown order. Its test statistic includes a nonparametric consideration for serial correlation in testing the regression. Consider the following structure of a time series variable X:

$$X_t = a_0 + a_1 X_{t-1} + a_2(t-T/2) + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

In equation 3 ε_t is a white noise error term and T stands for total observations. The null hypothesis in this procedure is that the variable contains a unit root, that is, a_1 is equal to 1 and statistically significant. The test of unit root may be applied with or without including a trend term.

The results of Phillips-Perron (1988) test are reported in Table 2. The variables used in equation (1) are the first differences of Y and U. Table 2 shows that these variables are non-stationary at the level but stationary at first difference. Similarly, in equation 2 we take the first difference of Y and U from their potential and natural levels respectively. Again these variables are non-stationary at the level but stationary at the first difference. In view of stationarity of the modeled variables we applied OLS to estimate the 'Difference' and 'Gap' versions of Okun's law using data for Pakistan.

Insert Table 2 about here

Insert Table 3 about here

Interpretation of Results

The results of OLS estimates of equations (1) and (2) are reported in Table 3. Column 2 of Table 3 contains parameter estimates of equation (1) which is the 'Difference' version of Okun's law. Column 3 contains parameter estimates of the 'Gap' version of Okun's law. In equation (1) the intercept term has a large value of 5.21 and is statistically significant at 1 percent level of significance. The coefficient of the unemployment gap has a negative value of 0.47 which is much lower than Okun's initial estimate of 3 percent and later estimates of 2-2.5 percent. However, this coefficient is not statistically significant which is indicative of the nonexistence of the Okun's law in case of Pakistan. The estimates of the 'Gap' version of Okun's law are given in the last column of Table 3. The intercept term has a negative value of 0.001 which is very low and interestingly this is not statistically significant. The estimate of the coefficient on the unemployment gap ($U_t - U_t^*$) is unexpectedly positive with a negligibly small value of 0.001. The only significant coefficient is on the lagged value of GDP gap with a value of 0.94 which indicates that GDP in Pakistan is self explanatory and is not affected by fluctuations in unemployment. This also reflects that relevant data in developing countries is not reliable which should be used only cautiously. It also requires the collection and reporting of reliable data on socio-economic variables.

Conclusion

This study has used data from 1974 to 2009 for Pakistan economy to test the relevance of Okun's law using the 'Gap' and the 'difference' versions. The time series involved were first tested for stationarity and then used for estimation of the two models. As in case of other developing countries, the required data in Pakistan are not properly collected and maintained, the results are in dire opposition to what has been observed in most of the other countries. Our study could not find any evidence for the existence of Okun's relationship in Pakistan neither through the 'Difference' version nor through the 'Gap' version. Further, the inflation rate which interacts with unemployment is highly volatile and unstable in case of Pakistan. The study recommends further research on this topic by incorporating the behavior of inflation and allowing for trade-off between inflation and unemployment. This suggests use of simultaneous equation model so that the possible bias resulting from exclusion of some relevant variables.

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Table 1: Growth Rate of GDP and Unemployment Rate in Pakistan

Year	GDP growth (Percent)	Unemployment (Percent)
1974	7.45	1.8
1975	3.26	1.7
1976	3.37	2.2
1977	2.81	2.6
1978	7.84	3.1
1979	5.57	3.6
1980	6.91	3.6
1981	6.21	3.6
1982	7.56	3.6
1983	6.79	3.9
1984	3.97	3.9
1985	8.71	3.7
1986	6.36	3.6
1987	5.81	3.1
1988	6.44	3.1
1989	4.81	3.1
1990	4.59	3.1
1991	5.57	6.3
1992	7.71	5.6
1993	2.27	4.7
1994	4.54	4.8
1995	5.24	5.4
1996	5.19	5.4
1997	1.98	6.1
1998	3.49	5.9
1999	4.18	5.9
2000	3.91	7.82
2001	2.09	7.82
2002	3.49	8.27
2003	5.08	8.27
2004	6.60	7.69
2005	8.57	7.69
2006	5.80	6.5
2007	6.80	5.32
2008	3.70	5.2
2009	1.70	5.5
Mean	**5.11**	**4.91**
C.V.	**2.68**	**2.59**

Source: Pakistan Economic Survey (Various Issues).

Table 2: Tests for Unit Roots Based on Phillips-Perron (1988) Test Methodology

Variable	Without Time Trend		With Time Trend	
	Level	First difference	Level	First difference
Y_t	-1.033745 (0.7302)	-3.933080[#] (0.0047)	-1.167811 (0.9018)	-4.128399[#] (0.0135)
Y_t^*	-1.317770 (0.6103)	-3.933080[#] (0.0047)	-1.167811 (0.9018)	-4.128399[#] (0.0135)
U_t	-1.750723 (0.3979)	-5.652032[#] 0.0000	-1.981571 0.5908	-5.744697[#] 0.0002
U_t^*	-2.126361 (0.2360)	-5.652032[#] (0.0000)	-1.981571 (0.5908)	-5.744697[#] (0.0002)

Note: [#] shows the level of significance at 1%.

Table 3: OLS Estimates of Okun's Law in Pakistan

Independent Variables	Dependent Variable	
	(1) Y_t-Y_{t-1}	**(2)** $Y_t-Y_t^*$
Constant	5.214234[#] (15.51682)	-0.000723 (-0.231226)
U_t-U_{t-1}	-0.467080 (-1.048879)	-
$(U_t-U_t^*)$	-	0.000564 (0.174528)
$D(Y_t-Y_t^*)(-1)$	-	0.939279 (12.73458)[#]
F-statistic	1.100148	91.48869[#]
R-Squared	0.032262	0.851147
Adj. R-Squared	0.002937	0.841844
S.E. of Regression	2.016098	0.018477
Durbin-Watson Stats	1.426960	1.281750

Note: [#] shows the level of significance at 1%.

Figure-1: GDP Growth Rate over Time

Figure 2: Trends in Unemployment in Pakistan