Okun’s law and its validity in Egypt

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Abstract
Okun’s law is a key relationship in microeconomics and finds that the relationship implies that a GDP growth by 3% leads to 1% decrease in unemployment Okun (1970). Recently, many studies find that the relationship between GDP and unemployment is not 3% as Okun’s law suggests but sometimes it is between 2.5% and 2% (Samuelson and Nordhaus, 1995). This paper tests Okun’s coefficient in Egypt. The paper uses co-integration analysis to estimate Okun’s coefficient in the long run. and in the short run by using the Error Correction Mechanism (ECM). The analysis depends on annual data from the International Financial Statistics (IFS) published by the IMF for the period 1970-2010. When Okun’s law was estimated in Egypt in the long run and short run the coefficient was statically significant with the expected sign.

Keywords: Unemployment, Okun’s coefficient, Egypt
JEL Classification:C22, E24
1. Introduction

One of the largest problems that most developing countries face is unemployment. Unemployment can be regarded as the cause of poverty and economic dispersion. Okun’s law defines an inverse association between cyclical fluctuations in the output gap and the unemployment gap, where the values of coefficients vary from country to country and time to time (Lal et al, 2010).

The subject of unemployment is a pervading challenge in developing economies. With the incidence of the global economic crisis, the increasing rate of unemployment extends even in developed nations of the world. The high incidence of unemployment implies inefficient use of the labor macroeconomic resources available in the country or region under study. However, full employment, one of the primary economic goals of the government of a country, implies effective maximization of its resources.

Okun’s law is a key relationship in macroeconomics and it was proposed by the American economist Okun (Caraiani, 2010). In its original form, the relationship implies that a GDP growth by 3% leads to a 1% decrease in unemployment.

It is the feature of supply side economics, as output increases in a recovery phase resulting in unemployed workers being hired. If output falls in a recession phase consequently workers are laid off from their jobs (Mossa, 2008).

2. Rationale and Objectives of the Study

The aim of this paper is to test Okun’s law and its validity in Egypt. This research estimates the relationship between the output gap and unemployment gap in the long run by using co integration and short run by using the Error Correction Mechanism (ECM).

This exercise is undertaken because very few attempts of this kind have been made. The motivation for doing this work is straightforward: if Okun’s law is valid for Egypt this will provide information about the kind of unemployment in Egypt (cyclical or otherwise), which would then imply whether or not unemployment can be reduced by boosting growth.

The data of the output and unemployment gap is annual data from 1970 to 2010. The output data was collected from Financial International Statistics (FIS) and the Unemployment data was collected from the World Labour Organization.

The organization of the paper is as follows: Section 3 presents some literature on Okun’s law. The methodology is explained in Section 4. The results are presented in section 5 and Section 6 concludes.
3. Literature Review

After the publication of Okun’s seminal paper, many studies were carried out in order to test Okun’s law in the US, as well as for other developed countries. However, most of the studies concentrated on the case of the United States, such as by Gordon (1984), Evans (1989), Prachowny (1993) and Weber (1995).

Gordon (1984) starts from an identity between the real GNP and the unemployment rate together with a few other variables, like productivity or the labour force participation rate. He estimates an econometric equation to study the relationship between real GDP and unemployment and he obtains short run Okun’s coefficient of 0.23 and long run coefficient of 0.5, much higher than the value given by Okun’s long run coefficient.

Evans (1989) uses data for the US economy from 1950 to 1989 in order to assess the relationship between the GDP growth and the unemployment rate. He finds that there is a long run relationship between the GDP growth and unemployment at about 0.30, in line with Okun’s findings.

Prachowny (1993) uses a production function in which he includes factors like capital utilisation and the number of hours worked. When he runs the regressions between the output gap and the unemployment gap he finds much smaller values for the impact of a 1% unemployment reduction upon the output growth than in the case of Okun’s paper.

Weber (1995) uses four different methods to extract the cyclical components of output and unemployment. He uses the cyclical components to estimate Okun’s coefficient for the US economy for the period 1948-88. As he underlines, these approaches are not different in their empirical design, but rather they are based on different economic conceptions of the output-unemployment rate relationship. His results show that the estimates of Okun’s coefficient are influenced by the methods used. He finds that the values of the coefficient range from -0.22 to -0.31, thus contradicting the claim that Okun’s coefficient is rather stable around the -0.3 value.

Gabrisch & Buscher (2006) find that labour market rigidities do not play an important role in explaining high unemployment rates. However, GDP growth is dominated by productivity progress and the employment-relevant component of aggregate demand is too low to reduce the high level of unemployment substantially.

Singlair (2009) finds that permanent movemonets in U.S. output and unemployment rate are important for explaining overall fluctuations. Moreover, the correlation between

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changes in these series arise in large part due to the relationship between their permanent components.

A few studies have estimated Okun’s coefficient in other countries such as Mossa (2008). He estimates Okun’s coefficient in 4 Arab countries during the period 1990-2005. He finds that the value of Okun’s in Algeria is -0.011, -0.001 in Egypt, -0.00009 in Morocco and 0.001 in Tunisia.

4. Methodology

Generally, there are two standard model specifications of Okun’s law, first is the “First difference model” and second is the “Gap model” (Lal et al, 2010). According to the first-difference model, the link between the natural log of real output (Y_t) and the natural log of the unemployment rate (U_t) is given as:

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

Y_t - Y_t^* = \alpha + \beta (U_t - U_t^*) + \varepsilon_t \quad (2)

Where Y_t^* refers to the log of potential output and U_t^* is the natural rate of unemployment. Where \alpha is the intercept, \beta is Okun’s coefficient computing how much variation in the unemployment rate to changes in output and \varepsilon is the disturbance term.

I calculate the potential output in the following way. First, I regress the output on a constant a time trend.

Y_t = \theta + \theta \times time + \varepsilon_t \quad (3)

Where Y_t is the log of output at time t, time is the time trend, and \varepsilon_t is the error term with mean zero and finite variance. Second, the potential output is described as the predicted value of Equation (3).

Y_t^* = \hat{\theta} + \hat{\theta} \times time \quad (4)

The Gap model has been chosen for further analysis of Okun’s law, where the left-hand side represents the output gap and right-hand side represents the unemployment gap (U_t - U_t^*). Thus, the difference between the observed and potential real GDP postulates the fluctuations in output. Similarly, the difference between the observed and the natural rate of unemployment refers to the cyclical rate of unemployment.

Most macroeconomic variables are non-stationary series. Differencing of time series can remove the non stationarity of the variables. In this paper, co integration technique confronts the spurious regression and the Error Correction technique provides short run dynamics which tries to find the causal relationship in the short run.
A series will be stationary by differencing “d” and denoted as I(d). The Augmented Dickey Fuller (ADF) test is also known as a unit root test and used for testing the stationarity and non stationarity of the series. The ADF regression equation is as follows:

\[ \Delta Y_t = \alpha + \beta Y_{t-1} + \sum_{j=1}^{p} \beta_j \Delta Y_{t-j} + \mu_t \]

(5)

Where

- \( Y_t \) = time series
- \( \Delta = \) first difference
- \( T = \) linear trend
- \( \alpha = \) constant intercept
- \( \mu = \) error term

The null hypothesis of the existence of a unit root is \( \beta = 0 \). If any variable is found to be non-stationary, it will be tested for stationarity at its first difference form. If each variable has achieved stationarity after first differencing then a bivariate co integration test will be employed to know the relationship between the variables.

5. Empirical Results

First I conduct the c integration analysis. Table 5.1 shows the results of the Augmented Dickey Fuller (ADF) test on the first difference based upon the Mackinnon P values at various lag lengths. The preferred lag length based upon the Akaike information Criterion (AIC) These indicate that cointegration is generally accepted.

Table 5.1 shows the estimation results. As is evident from this table the unemployment gap coefficient is estimated to be negative (0.022) and statistically significant at the 1% level. Table 5.2 shows the Error Correction Mechanism (ECM). It indicates a negative relationship between the output gap and unemployment gap. Most importantly of course the lagged error is negative and significant. This confirms the acceptance of the long-run relationship; which is further validated given there are no problems with any of the diagnostic tests presented (the AR(1) test for first order residual autocorrelation, the ARCH(1) test for autoregressive conditional hetroscedasticity and the Jarque-Beta test for normality).

These results are similar to the other studies that estimated Okun’s efficient in Egypt. Mossa (2008) found that Okun’s coefficient is -0.001 in Egypt during the period 1975-2005.

Table 5.1: Co integration Analysis

<table>
<thead>
<tr>
<th>Dependent Variable (Output Gap)</th>
<th>Coefficients</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable (Unemployment Gap)</td>
<td>-0.022</td>
<td>***</td>
</tr>
<tr>
<td>Constant</td>
<td>0.011</td>
<td>***</td>
</tr>
<tr>
<td>CDRW</td>
<td>1.12</td>
<td></td>
</tr>
</tbody>
</table>
### ADF Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Favoured lag Length=2</th>
<th>Favoured lag Length=2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF(0)</td>
<td>0.008</td>
<td>0.005</td>
</tr>
<tr>
<td>ADF(1)</td>
<td>0.075</td>
<td>0.004</td>
</tr>
<tr>
<td>ADF(2)</td>
<td>0.071</td>
<td>0.004</td>
</tr>
<tr>
<td>ADF(3)</td>
<td>0.052</td>
<td>0.002</td>
</tr>
</tbody>
</table>

***=significant at 1%
**=significant at 5%
*=significant at 10%

ADF figures show the Mackinnon approx P-value

### Table 5.2: Error Correction Mechanism (ECM)

<table>
<thead>
<tr>
<th>Dependent Variable (Output Gap)</th>
<th>Coefficients</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.009</td>
<td>***</td>
</tr>
<tr>
<td>Lagged Error</td>
<td>-0.645</td>
<td>***</td>
</tr>
</tbody>
</table>

No. of observation: 40

F-statistics: 8.45 (***)

Adjusted R²: .82

DW: 2.45

AR(1): 1.62

ARCH(1): 1.75

Normality: 2.42

***=significant at 1%
**=significant at 5%
*=significant at 10%
6. Conclusions

This paper empirically analyses the relationship between the output and unemployment in Egypt by testing Okun’s law which employs long run co integration analysis and short run analysis (ECM). The analysis uses annual data from 1970-2010.

When Okun’s law is estimated for Egypt in the long run the relationship between the output gap and unemployment gap is statistically significant and this negative sign was found to be consistent with the theoretical rational. When Okun’s law is estimated for Egypt in the short run it is statically significant with the expected sign.

The responsiveness of unemployment to output presents ready options for reducing the level of unemployment which has been inherited from earlier transition shocks.

One option is to increase the flexibility of labour markets (raise Okun’s coefficient), another option is to support output growth at a higher rate than has been done to date.

We have found relatively high coefficients and conclude that there is very little leeway for additional liberalisation measures. This seems to be in accordance with the latest literature in this field. Furthermore, one strong obstacle to reducing the stock of unemployment is technological progress which is reflected in the increased constant in regressions.

Technological progress leads to job reduction and to weak job creation in industry, which again is not linked to systemic transition. The objective of reducing unemployment by more than it has been to date would require an output growth rate significantly higher than the growth rate of productivity.

These imply that the Egyptian government should increase the growth rate of GDP by encouraging private and public investment to reduce the unemployment rate.

References


