

The Effect of Unemployment Rate on Gross Domestic Product: Case of South Africa.

Teboho Jeremiah Mosikari

Economics Department, North West University (NWU),
Mafikeng campus, South Africa
E-mail : tebza.minus@yahoo.com, Tel: +2718 389 2654

Doi:10.5901/mjss.2013.v4n6p429

Abstract

Unemployment is the macroeconomic problem that affects individuals most differently and severely. This study investigates the effect of unemployment on gross domestic product in South African. The annual time series used for the estimation cover the period 1980-2011. Using Augmented Dickey-Fuller (ADF) stationarity test, the variables proved to be integrated of order one. Johansen cointegration test was applied to determine the presence of cointegrating vectors in the variables. Also Granger causality test was applied, it was found that there is no causality found between unemployment rate and GDP growth. Finally, this study encourages all policies on economic growth with the idea that growth will bring employment in South African economy.

Keywords: Unemployment, GDP growth, Cointegration, Causality

1. Introduction

The relationship between unemployment and gross domestic product (GDP) has been well documented in the literature. Unemployment is the macroeconomic problem that affects individuals most differently and severely. The loss of employment means reduced standard of living and psychological stress. Researchers study unemployment to identify its causes and to help in policies that affect unemployment. Levinson (2008) explained that unemployment is associated with social problems such as poverty, crime, violence, a loss of morale and degradation. The significance of employment lies not only in the income earned but also the intangible and invaluable benefits it provides including dignity, accomplishment and freedom. High job opportunities and economic participation would help in reducing poverty and income inequality. There are various policy options that can be implemented to sustain employment such as training programs that aim to enhance skills and wage subsidies that aim to increase the efficiency of job search.

Ernst and Berg (2009) explain that high growth is associated with a high degree of employment intensity which is a necessary condition for the reduction of poverty. In 2006, 195 million workers were unemployed, amounting to 6.3% of the world labour force. That same year, 1.37 billion workers, nearly half of the world workers were considered as "working poor" implying that they live less than USD 2 dollars per day. South Africa is continuously facing high unemployment as one of the pressing socio-economic factors facing the country. According to National Treasury (2011) two in five working age adults in South Africa have employment and more than 4 million people (i.e. 24 % of the workforce) are currently unemployed. The country is facing punitive reality that not enough people are working. Out of a population of approximately 50 million citizens there is only 13.1 million employed. During the latest recession in the South African economy, employment growth accelerated more or less in tandem with output growth. Employment contracted by 0.7% in 2010 compared with a decline of 3.0% in 2009.

To understand the rate of South African economic growth over the past decade, the initial step is to identify its contributors. The growth in the South African economy grew modestly and steadily during the last decade. The average real GDP growth rate for the decade since 1994-2004, was 3.0%. This represents an improvement on the 0.8% average growth rate for the previous year's 1985-1994. Ocran (2009) describes this period as characterised by more openness as the country ended its apartheid deepened and its integration in the world market. The South African economy steadily grew in 2010 and the early parts of 2011. For 2010 as a whole, the economy grew by 2.8% following a downturn of 1.7% in 2009. The South African economy benefited during 2010 global economic activity as well as the success of the 2010 FIFA world cup.

It is obvious that unemployment is a key variable that the policy makers, firms and also individuals watch closely as a current and future position of the economy. It is important to know the degree to which the unemployment rate affects the output of the economy and, moreover, to see behind the mechanism through which these effects take place. In particular, unemployment behaviour during the business cycles is essential with regard to policy making, as it reveals how strong the connection between the labour market and the goods market is. The main purpose of this study is to confirm whether the Okun's Law has held for the South African economy. In this regard, the study asks the following questions: Which is the Okun coefficient for the South African economy? Is it statistically significant? What are the factors that have determined the value of the Okun coefficient in South Africa?

The remainder of the paper is as follows: the following section highlight on the literature survey, followed by the research method which includes data and model specification. The followed section deals with empirical results and lastly the concluding remarks.

2. Literature survey

Meidani and Zabihi (2011) study the dynamic effect of unemployment rate on per capita real GDP in Iran. The study intends to offer a thorough statistical investigation of the joint dynamics of output and unemployment rate. Their study covered the period 1971 to 2006, using Auto-regressive Distribution lag (ARDL). The results of ARDL long run coefficients reveal that unemployment rate is statistically significant in determining per capita real GDP in the long-run. Based on the results of short run and long run, unemployment rate is positively related with per capita real GDP.

Rigas, Theodosiou, Rigas and Blanas (2011) examined whether the Okun's law continues to be valid in today's economic environment. Their study uses data with regard to the unemployment and the real GDP of three countries, Greece, France, and Spain. From the findings the study concludes that the reaction of GDP to changes in unemployment and, more generally to Okun's coefficient differ substantially among the three countries. Furthermore, based on causality findings, a two-way causal relation between the GDP and rate of unemployment does not exist for any of the three countries.

Kitov and Kitov (n.d¹) described unemployment as a superior macroeconomic socio-economic problem. This led Caraiani (2006) explains that the importance of employment is that the labour market is one of the key markets that directly affect the life of the people. Caraiani's study uses regression analysis in order to derive Okun's coefficients for the period 1970-2004. The results show that there is a consistency with regard to employment and unemployment cyclical behaviour irrespective of the frequency. The study further indicates that Korean labour market is of the heaviest regulated among the developed economies. The author suggested that the rationale for a labour market reform, in terms of making hiring and firing to be much more flexible.

For decades government have been concerned to maintain a balance between policies which protects workers against job losses and those which restrain the unemployment rate. Malley and Molana (2001) engaged in a study where they were examining the relationship between the level of output and the rate of unemployment. The study reveal that using an estimation method which allows for trends, cyclical changes and breaks, only Germany out of pooled data that shows a negative relationship between the level of output and the rate of unemployment.

Other researchers believe that the connection between growth and unemployment comes through Okun's law, which states that there is an inverse relation between output and unemployment. This claim led Sinclair (2004) conducted a study by developing a bivariate correlated unobserved components model to study the interaction between unemployment and output. The findings of the study reveal that the movements indicates that GDP and unemployment are more strongly linked.

Revoredo-Giha, Leat and Renwick (2012) studied the relationship between output and unemployment in Scotland. Their study was influenced by a decline in Scottish labour market conditions, the situation did not improve even if Scottish economy moved out of recession in 2009 the fourth quarter. The finding of their study shows that the differences in the composition of the economy of rural and urban areas lead to a strong relationship between growth and employment in urban areas. Moreover, Stephan (2012) modelled Okun's law for France and United Kingdom inside a bivariate unobserved component model. The study used data from OECD for year 1969:1 to 2011:2 for France and from 1971:1 to 2011:2 UK using quarterly data. The results of the study show a negative correlation between trends of both series supporting real business cycle theory.

¹N.d means "no date" for those authors.

The Okun's Law is a known principle which describes that there is an inverse nexus between output growth and unemployment rate. Noor, Nor and Ghani (2007) engaged in a study to examine the Okun-type relation between output and unemployment in Malaysia during 1970 to 2004. Their study applied basic econometric analysis of testing stationarity using ADF and Phillip-Perron tests. Their findings also find that there is a negative relationship between unemployment and output growth. Furthermore, they confirmed that there is a two way causality unemployment and GDP in Malaysian economy.

This section has critically examined the empirical literature on the effect of unemployment on GDP growth. It would appear on balance, that there seems to be more empirical evidence of a negative relationship between unemployment rate and GDP growth. However, the analysis of this phenomenon is still subject to debate and further empirical research. The following part of this study deals with the methodology of the study.

3. Research Methodology

3.1 Data collection

The study uses time series set to examine the existence of relationship between unemployment rate and economic growth in South Africa during 1980-2011. The economic growth in use is conventionally calculated by using GDP. This paper considers four variables: unemployment rate, consumer price index, gross domestic product and total investment. All these four variables are collected from the *International Financial Statistics* (International Monetary Fund). The statistical software package EViews 7 will be used to run all necessary analysis of the study.

3.2 Model description

The study estimates the relationship between unemployment rate and economic growth using the following equation:

$$\text{GDPCP} = F(\text{GVEXP}, \text{INFL}, \text{INVT}, \text{UNEMP}, E) \quad (1)$$

Where GDPCP represents gross domestic product, GVEXP for general government expenditure, INFL for average consumer prices, INVT for total investment, UNEMP for unemployment rate and E for error term. The study uses regression analysis to makes estimates between unemployment rate and economic growth. Regression analysis is a statistical technique that attempts to "explain" movements in one variable. There is almost always variation that comes in from sources such as measurement error, incorrect functional form, or purely random and totally unpredictable occurrences. The current study admits the existence of such inherent unexplained variation "error" by explicitly including a stochastic error term in the model.

In order to undertake the objective of the study it is important to first examine the time series properties of the variables taken in logarithmic terms. It should be noted that most business and economic time series are far from stationary when expressed in their original units of measurement they will exhibit random-walk and non-stationary. Before estimating the model in equation (1), this paper will investigate whether the series are faced by non-stationarity. A stationary time series is one series whose basic properties do not change over time, while a non-stationary variable has some sort of upward or downward trend.

One problem with time series data is that independent variable can appear to be more significant than they actually is if it has the same underlying trend as the dependent variable. This causes non-stationary variables to appear to be correlated even if they are not. Therefore the current study needs to test for stationarity conditions of variables in order to avoid spurious regression. The stationarity of the variables will be investigated by employing the unit root tests developed by Dickey and Fuller (1979). The second step is to test for cointegration among those variables using the Johansen's (1991) methodology. The generalisation of the Johansen procedure is as follows:

$$\Delta y_t = \sum \Pi_i \Delta y_{t-1+i} + \Pi y_{t-n} + \varepsilon_t \quad (2)$$

Where $y_t = (K \times 1)$ vector of variables $(\beta_1 y_{t-1}, \beta_2 y_{t-2}, \dots, \beta_n y_{t-n})$, ε_t is independent and identically distributed n-dimensional vector with mean zero and variance equal to matrix Σ . ε is the number of independent co-integration vectors, and Πy_{t-n} is the error correction factor. The Johansen procedure relies on the rank of Π and its characteristics roots. If $\text{rank}(\Pi) = 0$, the matrix is null (no cointegration) and equations in vector y_t are a common VAR in first differences. If Π has full rank ($\Pi = k$), the vector process is stationary and the equations in y_t are modeled in levels - $I(0)$. If $\text{rank}(\Pi) = 1$, there is evidence of a single cointegrating vectors in Johansen's cointegration procedure is applied to this study. These tests are:

Trace test

$$\lambda_{\text{trace}}(r) = -T \sum \ln(1 - \lambda_i), \text{ and} \tag{3}$$

Maximum eigenvalue test

$$\lambda_{\text{max}}(r, r + 1) = -T \sum \ln(1 - \lambda_{r+1}) \tag{4}$$

Where $\lambda_{r+1}, \dots, \lambda_n$ are the (k-r) smallest estimated eigenvalues. In both tests, λ represents the estimated values of the characteristics roots obtained from the estimated Π matrix, and T is the number of observations. The trace test attempts to determine the number of cointegrating vectors between the variables by testing the *null hypothesis* that $r = 0$ against the alternative that $r > 0$ or $r \leq 1$ (r equals the number of co-integrating vectors). The maximum eigenvalue tests the *null hypothesis* that the number of co-integrating vectors is equal to r against the alternative of r+1 co-integrating vectors. If the value of the likelihood ratio is greater than the critical values, the null hypothesis of zero cointegrating vectors is rejected in favor of the alternatives.

The third and final step in this study involves a causality test based on the results provided by the long run regression. The standard Granger causality test is applied. The structure of causality is as follows:

$$DLGDPCP_t = \alpha_0 + \sum \beta DLUnemp_{t-i} + \epsilon_t \tag{5}$$

$$DLUnemp_t = \alpha_0 + \sum \beta DLGDPCP_{t-i} + \mu_t \tag{6}$$

Where ϵ and μ are uncorrelated disturbance terms. The technique was developed by Granger (1969) where he defines the “arrow of time” to help us identify between cause and effect. According to this approach, a variable Y is caused by X if Y is better predicted from past values of Y and X together rather than from past values of Y alone.

3.3 Empirical results

As discussed in the methodology section, before applying the cointegration techniques preliminary test must be performed such as unit root test. The table 1 below represents the results of ADF test for all the variables under scrutiny.

Table 1: ADF results at levels and first difference

Variables		ADF Model	ADF Statistics	Probability Value
GDPCP	Levels	Trend + Constant Constant	-1.488 -0.160	0.8113 0.9333
	First levels	Trend + Constant Constant	-2.535 -3.428**	0.3102 0.0177
INFL	Levels	Trend + Constant Constant	-0.222 1.788	0.9886 0.9995
	First levels	Trend + Constant Constant	-1.790 -0.120	0.6788 0.9320
INVT	Levels	Trend + Constant Constant	-1.935 -2.236	0.6124 0.1981
	First levels	Trend + Constant Constant	-7.226*** -6.191***	0.0000 0.0000
UNEMP	Levels	Trend + Constant Constant	-1.710 -2.036	0.7222 0.2704
	First levels	Trend + Constant Constant	-5.516*** -5.280***	0.0005 0.0002

Notes: 1 the lag length is specified using the schwarzinfor criterion (SIC). ADF test statistics and significance level: * = 10 %, ** = 5%, *** =1%.

The first step of the study is to verify the order of integration of the variables since some co-integration tests are only valid if the variables have the same order of integration. The Augmented Dickey Fuller (ADF) test is used to find the degree of integration of the variables used. Table 1 above represents the results of ADF for all the variables used. The analysis indicates that all the variables are non-stationary in levels. However, once differenced they all became stationary. The second step is to identify the existence of cointegration using the Johansen cointegration approach. Having confirmed the stationarity of the variables $I(1)$, the study proceed to analyses the presence of cointegration among the variables under scrutiny. The two criterion are used the trace test and Eigen value are used for cointegration test.

Table 2:Unrestricted Cointegration test Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value
None	0.712254	86.640**	69.818
At most 1	0.522693	49.270**	47.856
At most 2	0.398376	27.082	29.797
At most 3	0.262149	11.838	15.494
At most 4	0.086625	2.7182	3.8414

Trace test indicates 2cointegration equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

Table 3:Unrestricted Cointegration test Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value
None	0.712254	37.370**	33.876
At most 1	0.522693	22.187	27.584
At most 2	0.398376	15.243	21.131
At most 3	0.262149	9.1204	14.264
At most 4	0.086625	2.7182	3.8414

Trace test indicates 1cointegration equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

The results from table 2 and 3 it shows that there are two cointegrating vectors for trace and 1 cointegrating vector for maximum Eigen value. For such information this study concludes that there is a unique long run relationship among the variables selected for estimation in this particular study. When the cointegration is present, it means GDPCP, GVEXP, INFL, INVT and UNEMP share a common trend and long run equilibrium as suggested.

The results of Granger causality are presented in the table 4 below. The results show that in estimating equation 6, unemployment rate appears not to "granger-cause" the growth GDP at 5% significance level. Also considering the causality of equation 5, growth of GDP appears not to "granger-cause" unemployment rate.

Table 4:Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
DLOG_UNEMP does not Granger Cause DLOG_GDPCP	29	0.76043	0.4784
DLOG_GDPCP does not Granger Cause DLOG_UNEM		0.86645	0.4332

4. Concluding remarks

The present investigation studies the relationship between unemployment rate and gross domestic product. The study employed annual time series data spanning from 1980 to 2011. The study tested the variables for stationarity and found that all the variables are non-stationary at level but stationary at first difference. The Johansen cointegration results found cointegrating relation among the variables under study. The study also applied granger causality test, it was found that either way there is no causality exist between unemployment rate and GDP growth in South Africa. After detecting a long-run relationship among variables used in this study. It implies that all the variables in the system have the tendency to revert back to their equilibrium. From these results, this study encourages all policies on economic growth with the idea that growth will bring employment in South African economy.

References

- Caraiani P. (2006) the relationship between unemployment and output cycles in korea" Romanian Journal of Economic Forecastin – 1/2006
- Dickey D.A and Fuller W.A. (1979) "Distribution of the estimators for autoregressive time series with a unit root", Journal of the American Statistical Association 74: 427-431.
- Ernst C. and Berg J. (2009) "The Role of Employment and Labour Markets in the Fight against Poverty" PROMOTING PRO-POOR GROWTH: EMPLOYMENT – OECD, 2009
- Granger, C. W. J. (1969). "Investigating Causal Relations by Econometric Models and Cross-spectral Methods". *Econometrica* 37 (3): 424–438.
- Johansen, S. (1991). "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrica*, 59: 1551–1580.
- Kitov I. and Kitov O. (n.d) "Employment, unemployment and real economic growth" Institute for the Dynamics of the Geopsheres, Russian Academy of Sciences, Department of Economics, University of Oxford.
- Levinsohn J. (2008) "Two Policies to Alleviate Unemployment in South Africa", CID Working Paper No. 166, Center for International Development, at Harvard University.
- Malley J. and Molana H. (2001) "The Relationship between Output and Unemployment with Efficiency Wages" Department of Economics, University of Dundee, Dundee DD1 4HN, UK
- Meidani A.N and Zabihi M. (2011) "The Dynamic Effect of Unemployment Rate on Per Capita Real GDP in Iran" *International Journal of Economics and Finance* Vol. 3, No. 5; October 2011.
- National Treasury (2011) "*Confronting youth unemployment: policy options for South Africa*" Discussion Paper For Public Comment"
- Noor Z.M, Nor N.M and Ghani J.A (2007) "The Relationship between Output and Unemployment in Malaysia", Does Okun's Law exist? *International Journal of Economics and Management* 1(3): 337 – 344 (2007) ISSN 1823 - 836X
- Revoredo-Giha .C, Leat .P and Renwick .A (2012) "The relationship between output and unemployment in Scotland: A regional analysis" *LAND ECONOMY WORKING PAPER SERIES*, Number: 65, EH9 3J
- Rigas J, Theodosiou G, Rigas N, Blanas G. (2011) "The Validity of the Okun's Law: An empirical investigation for the Greek economy" *Journal of European Economy*, March 2011.
- Stephan .G (2012) "The relationship between output and unemployment in France and United Kingdom", University of Rennes, April 2012 (Preliminary draft)
- Sinclair T.M (2004) "Permanent and Transitory Movements in Output and Unemployment: Okun's Law Persists" Department of Economics, Washington University, Job Market Paper
- Ocran M.K (2009)"Fiscal Policy and Economic Growth in South Africa" A paper presented at the Centre for the Study of African Economies "Conference on Economic Development in Africa", St. Catherine's College, Oxford University, UK. March 22-24, 2009.