Journal of
Applied Sciences

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RESEARCH ARTICLE   **OPEN ACCESS**

Determinants of Unemployment in Swaziland

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ABSTRACT

The study investigates the macroeconomic determinants of unemployment in Swaziland. The Engle-Granger two steps econometric technique was used to investigate the effect of macroeconomic variables on unemployment in Swaziland. This econometric technique was used to also test the existence of long-run relationship between unemployment and its macroeconomic determinants. The investigation found evidence of long-run relationship between unemployment and its macroeconomic determinants. The results indicate that the ratio of actual to potential Gross Domestic Product (GDP), inflation, government spending, dummy variable for democratization of South Africa in 1994 and global economic crisis of 2007-2009 are determinants of unemployment in Swaziland. The Engle-Granger procedure was used to estimate the empirical model. The results indicate that unemployment in Swaziland can be reduced by accelerating GDP at the expense of high inflation. It can also be reduced by allocating a greater proportion of government spending on activities that increase investment and GDP. The simulated model results indicate that the model is good as the estimated of forecasted unemployment tracks the actual unemployment.

Key words: Unemployment, macroeconomic determinants, GDP, unit root, cointegration, actual output to potential output, government spending, Swaziland

INTRODUCTION

Swaziland, the second smallest state in mainland Africa once possessed one of the continents highest income levels per head. In 2001, the World Bank's Gross National Income (GNI) estimates led to the classification of Swaziland as a 'Middle income' economy. In 1985-89, the country recorded significant average annual growth in its Gross Domestic Product (GDP) of 10% which was the second highest after Botswana (Matthews, 2004). However, Swaziland is now a shadow of its former self as it has been engulfed with numerous problems that have threatened the economic stability of the country.

The 2008 global financial crisis further intensified the problems faced by the country as it lurched into a fiscal crisis. The fiscal crisis of 2011 brought to the fore underlying problems such as the weak business environment, low Foreign Direct Investment (FDI) influxes, an overvalued exchange rate, an extraordinary HIV and AIDS burden and most critically, a high unemployment rate. According to Brixiova *et al.* (2012), by the late 2000s, the unemployment rate, which had been gradually rising since the mid 1990s was one of the highest rates among Sub-Saharan Africa's middle income countries. In 2007 and 2010, the official unemployment rate (strict definition of unemployment) reached 28.2 and 28.5% of the labour force (ages 15 and above), whilst the unemployment rate stood at 38 in 2007 and 40.6% under the relaxed definition of unemployment (Government of Swaziland, 2010). The unemployment rate has remained high in the aftermath of the global financial crisis.

In light of the challenges above, the country has made several attempts of combating the unemployment epidemic.

The Swaziland Government, in collaboration with Workers and Employers Organizations has integrated national sectoral or local employment policies and programmes in their policy frameworks. Labour market information systems in Swaziland measure unemployment rate including gender disaggregation on a regular basis. Employment-intensive infrastructure programmes for local development in Swaziland aid in the creation of decent jobs. The Government, Employer's and Worker's Organizations in Swaziland have taken initiatives in policy areas that facilitate transition of informal activities to formality (ILO., 2010).

Despite attempts made at fighting unemployment, it continues to be a problem in Swaziland. The note worthy challenge to date is that of generating employment opportunities in adequate numbers so as to reduce the rise in unemployment or eradicate it completely. Evidence has shown that stagnant economic growth in Swaziland has been unable to provide the necessary job opportunities which has thus resulted in a rising unemployment rate. The problem has been aggravated by the HIV prevalence rate and the great number of new entrants into the labour force amongst other things. This means that labour absorption has been far lower than the rates necessary to hold the unemployment levels constant or prevent them from rising.

It is thus imperative to investigate the determinants of unemployment in Swaziland. The study paints a picture of the distribution of unemployment in Swaziland and further proceeds to investigate relevant literature, microeconomic and macroeconomic models of unemployment.

MATERIALS AND METHODS

Analytical framework, data and methodology
Empirical model for Swaziland: This study adopts a linear regression model with logarithmic transformations, where unemployment is modelled as a function several macroeconomic variables. These variables are ratio of actual GDP to potential GDP inflation (indicated by the Consumer Price Index (CPI)) and dummy variables. The empirical unemployment model for Swaziland is specified as follows in Eq. 1:

$$LUNEMP = \alpha + \beta_1 LACTGDPPOT + \beta_2 LCPI + \beta_3 LGSP + \beta_4 DUM94 + DUMCRISIS + \varepsilon_t \qquad (1)$$

where, LUNEMP, LACTGDPPOT, LCPI, LGSP, DUM94 and DUMCRISIS are unemployment, ratio of actual GDP to potential GDP, consumer prices, government spending, dummy for the end of apartheid in South Africa in 1994 and dummy variables for the global economic and financial crisis of 1994. This study acknowledges that there are other important variables that affect unemployment, but are not included in this empirical model because of lack of data in Swaziland.

Data: This study employs annual data over the period 1991-2012. The study thus has a total of 22 observations. Sodipe and Ogunrinola (2011) validated that a meaningful conclusion can be drawn from less than 30 observations. The absolute unemployment values were obtained by using the unemployment rate and the labour force data. The total labour force was obtained from the World Bank Development Indicators for the year 1991-2009. An autoregressive process was then applied to estimate the total labour force for the next 3 years until 2012 and the formula for determining the unemployment rate was applied in order to attain the absolute values of unemployment.

LACTGDPPOT is ratio of actual GDP to the potential GDP, LCPI is the consumer price index which has been used as a proxy variable for inflation and was obtained from the World Bank Development Indicators. The LGSP is government spending as a percentage of GDP. It was obtained from the International Monetary Fund's World Economic Outlook database. The DUM94 is a dummy variable capturing the impact of democratization of South Africa on unemployment in Swaziland. It is expected that democratization of South Africa in 1994 impacted on Swaziland's unemployment. The DUMCRISIS is a dummy variable capturing the effect for the global financial crisis of 2007-2011 that plunged Swaziland into a fiscal crisis.

Cointegration tests: The study employs the Engle and Granger (1987) technique for testing for the long-run relationship between economic variables and modelling their short-run relationship through an error correction model two step procedure. The first step is to test for a cointegration relationship between the variables. This is achieved through the use of unit root tests in order to determine the order of integration of the variables (Seddighi *et al.*, 2000). If the two variables are integrated of the same order, I (1) for instance, the OLS long-run equilibrium is estimated in Eq. 2:

$$Y_t = \beta_0 + \beta_1 X_1 + \varepsilon_t \qquad (2)$$

In this case, this is called the "Cointegration regression". For the two variables to be cointegrated, the equilibrium errors must be stationary. Once the test has been completed, a conclusion about the cointegration of the two variables is drawn according to the following hypothesis:

- H_0: $\delta = 0$, for non-stationarity, that is, for no cointegration
- H_1: $\delta < 0$, for stationarity, that is, for cointegration

After confirming the presence of a cointegration relationship between the variables, the second step is to estimate the Error Correction Model (ECM). According to De Boef (2001) the changes in y are regressed on changes in x and the previous period's equilibrium error, meaning that, the residuals from the cointegrating regression to estimate the equilibrium rate, ÿ and short-run dynamics, λ_2 in Eq. 3:

$$\Delta y_t = \lambda_1 + \lambda_2 \Delta x_t - y_{\mu t-1} + \eta_t \qquad (3)$$

Unit root test: Unit root test is the first step before the estimation of long-run and short-run equations. Time series models generate reliable results when applied to stationary data. Most economic data used to study different scenarios in the economy appear to be non-stationary and therefore, require transformations in order to achieve stationarity. Granger and Newbold (1974) indicated that a regression of non-stationary variables results in spurious regression. They further argued that non-stationary series were characterized by a high value of R^2 coupled with a low value of (Durbin-Watson statistic) is an indication of a false relationship.

The Augmented Dickey-Fuller is used to test for stationarity of the variables. The Augmented Dickey-Fuller unit root test is an extension of the Dickey-Fuller unit root test originally proposed by Dickey and Fuller (1979). The general strategy is that lagged differences, such as Δy_{t-1}, Δy_{t-2} are included in the regression such that its error term corresponds to white noise. This results in what is known today as the Augmented Dickey-Fuller tests (ADF tests) for which the same asymptotic critical values hold (Verbeek, 2008). It is expressed as follows in Eq. 4:

$$Y_i = \delta + \theta_i + Y_{t-1} + \theta_2 Y_{t-2} + \varepsilon_t \qquad (4)$$

This can be written in factorized form as in Eq. 5:

$$(1-\phi_1 L)\,(1-\phi_2 L)\,(Y_i - \mu) = \varepsilon_t \qquad (5)$$

The condition of stationarity requires that ϕ_1 and ϕ_2 should be less than one in absolute value (Verbeek, 2008).

Model simulation: Following the work of Musila (2002), this study conducts a simulation experiment in order to assess the prognostic accurateness of the model. According to Barreto and Howland (2006), the word simulation means the construction of an artificial model of a real system to study and understand the system. According to Brenner and Werker (2007) simulation models are characterized by approximately two factors which are implications and assumptions. The assumptions factor encompasses the premises, definitions and the boundaries for the model for example, the country setting or the time period. Frequently, simulations provide the tool to derive implications from assumptions in an analytical and logical way regardless of the adopted approach. The running of simulations results in the attainment of knowledge about the implications of these assumptions, similar to the analysis of mathematical equations.

RESULTS

Unit root results: The variables were subjected to the ADF stationarity test. The results are presented in Table 1.

Table 1: Unit root test results

Variables	ADF	
	Levels	1st Difference
LUNEMP		
Trend and intercept	-2.172190	-5.870124***
Intercept	-1.223359	-2.295290
None	2.034796	-0.875850
LACTGDPPOT		
Trend and intercept	-4.317634**	-3.483283*
Intercept	-4.388056***	-3.514786**
None	-4.494844***	-3.605729***
LCPI		
Trend and intercept	-3.592521*	-4.889078***
Intercept	-3.341988**	-4.588392***
None	-0.496383	-4.668669***
LGSP		
Trend and intercept	-2.655671	-5.279288***
Intercept	-1.929937	-5.494540***
None	1.001768	-5.472536***

*Statistically significant at 10% level, **Statistically significant at 5% level
***Statistically significant at 1% level

Table 2: Long-run results

Variables	Coefficient	Standard error	t-statistic	p-value
LACTGDPPOT	-0.710818	1.397211	-0.508740	0.6179
LCPI	-0.052542	0.043607	-1.204901	0.2458
LGSP	0.551303	0.125599	4.389391	0.0005
DUM94	0.139055	0.048780	2.850653	0.0116
DUMCRISIS	0.138236	0.044241	3.124637	0.0065
Constant	9.466845	0.441291	21.45259	0.0000

L: Transformation of variables into logarithms, R = 0.89, F-statistic = 27.18, Durbin-watson statistic = 1.45

The results of Table 1 reveals that the null hypothesis of a unit root process for LUNEMP and LGSP cannot be rejected. This means that these series exhibit the presence of a unit root in levels. However, the null hypothesis of a unit root for LCPI and LACTGDPPOT is rejected at 10, 5 and 1% levels of significance. All variables are stationary on first difference. The results of Table shows that unemployment and government expenditure are I(1), while other variables are I(0).

Long-run results: The long run results are presented in Table 2. With the exception of Government expenditure as a ratio of GDP, the coefficients of all explanatory variables are consistent economic theory or theoretical expectations.

The results show that there is a negative relationship between the ratio of actual GDP to potential GDP and unemployment. It is the ratio of actual to potential GDP increase by 1%, unemployment will decrease by 0.71%. This result is consistent with the theoretical expectations. This suggests that unemployment in Swaziland can be reduced by accelerating GDP. However, the coefficient is not statistically significant. The impact of inflation on unemployment is negative. A 1% increase in the consumer price index (inflation rate) causes unemployment rate to decrease by 0.05%. The relationship between inflation and unemployment is in line with economic theory. It provides evidence
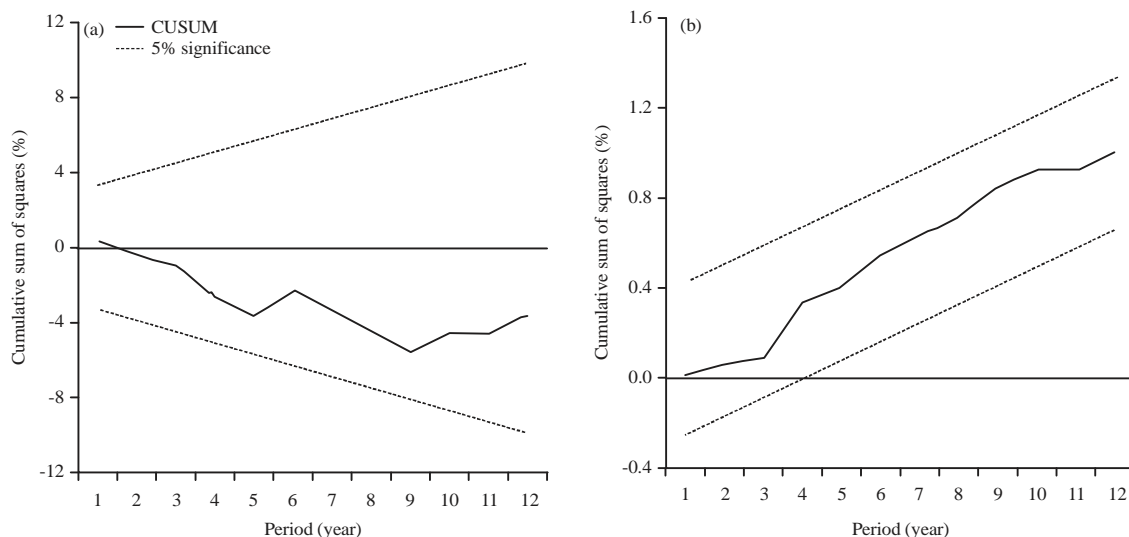
Fig. 1(a-b): (a) CUSUM test and (b) CUSUM test of squares

in favour of the Phillips curve for Swaziland, although the relationship is weak because the t-statistic is not statistically significant.

The coefficient of government expenditure is positive and statistically significant. It shows that if government expenditure increases by 1%, unemployment will increase by 0.55%. This coefficient is not in line with a priori expectations. This may be attributed to the expenditure pattern of the government of Swaziland, government funds may not be properly channelled towards unemployment reduction measures. The dummy variables, DUM94 and DUMCRISIS offer a logical economic explanation about the effect they have on unemployment. The democratization of South Africa in 1994 increased the unemployment levels in Swaziland. Before 1994, most companies considered Swaziland as better place to do business compared to South Africa, which was under economic sanctions because of apartheid. After 1994, South Africa became a democracy and apartheid came to an end. This attracted corporations to South Africa and this was to the detriment of Swaziland. The global financial crisis of 2007-2009 destabilized an already weak economy thereby intensifying the problem of unemployment in the country.

The residuals from the long-run equation were tested for unit root. The results indicate that the residuals are stationary. Stationarity of the residuals means that there is cointegration between the variables in the long-run equation. The results of the test for stationarity of the residuals are not presented here but can be obtained from the authors on request. It is now appropriate to proceed to the error correction model.

Error correction model: The presence of a cointegration relationship between the variables requires the estimation of the ECM in order to cater for the dynamic short-run and long-run relationship of the variables and to measure the speed

Table 3: Short-run results

Variables	Coefficient	Standard error	t-statistic	p-value
LUNEMP	0.688051	0.139276	4.940202	0.0003
LACTGDPPOT	0.776470	0.172421	4.503345	0.0007
LGSP	-0.052062	0.018889	-2.756276	0.0174
LFDI	-0.003139	0.001513	-2.074768	0.0602
Constant	0.008590	0.004153	2.068351	0.0609
ECT_{t-1}	-0.069948	0.037958	-1.842794	0.0902

First difference operator R^2 = 82, F-statistic = 7.61, Durbin-watson statistic = 2.21, L: Transformation of variables into logarithms

at which prior deviations from equilibrium are corrected. The ECM is formulated by regressing the dependent variable at first difference (LUNEMP) onto the first difference explanatory variables plus the lagged value of the Error Correction Term (ECT_{t-1}) or residuals generated from the long-run equation. Foreign direct investment (LFDI) was added in the estimation as another variable that has a potential to explain variation in the short-run determination of unemployment. The results are presented in Table 3.

The results in Table 3 show that the coefficient of the lagged residuals (ECM) is negative and statistically significant. This means that there is adjustment to equilibrium. The coefficient of the ECM is the speed of adjustment and indicates 7% of deviation from equilibrium are corrected every year. The coefficient of all other variables are statistically significant. The R-squared of more than 50% shows that the regressions are a good fit. More than 50% of the variations in the dependent variables are explained by the explanatory variables.

The diagnostic statistics are presented in Table 4 and Fig. 1. The results of the diagnostic tests reveal that there is no serial correlation, no evidence of heteroskedasticity and the residuals are normally distributed. Figure 1 indicates that the regression is stable and there is no misspecification.
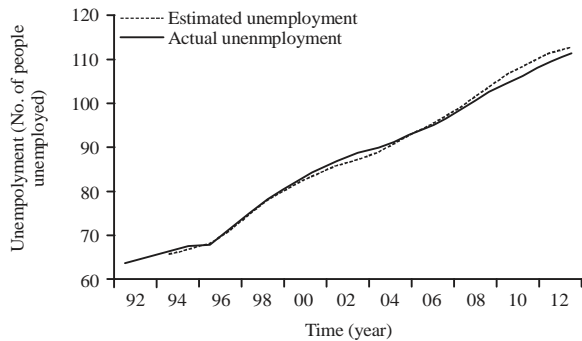
Fig. 2: Actual and estimated (forecasted) unemployment

Table 4: Diagnostic and stability tests

Tests	p-value	Conclusion
Breusch-Godfrey LM test	0.2833	Failure to reject H_0
White's Heteroskedasticity test	0.2704	Failure to reject H_0
Jarque-Bera normality test	0.5966	Failure to reject H_0

Simulation results: The long-run and short-run results were simulated in order to compare the actual and the estimated unemployment. The results are presented in Fig. 2. Figure 2 shows that the model is a good fit because the estimated unemployment is tracking the actual unemployment.

DISCUSSION

This study estimated unemployment in Swaziland as a function of several macroeconomic variables. Unemployment in Swaziland modelled as a function of ratio of actual GDP to potential GDP, consumer prices (inflation), government spending, dummy variables for democratization of South African in 1994 and financial crisis of 2008. The Engle-Granger two steps econometric technique was applied to estimate the unemployment equation as specified in Eq. 1. To the best knowledge of this study, this is the first empirical analysis of unemployment in Swaziland using an econometric model. The ratio of actual to potential GDP is associated with a reduction in unemployment. The negative effect of this variable on unemployment is consistent with the theoretical expectation. It is in line with the finding of other empirical studies, such as Eita and Ashipala (2010), Kabaklarli *et al.* (2011) and Cheema and Atta (2014).

As per a priori expectations, there is a negative relationship between unemployment and inflation. The results indicate that unemployment in Swaziland can be reduced at the expense of high inflation. Although the relationship between inflation and unemployment in Swaziland is not significant, it provides evidence that the Phillips curve holds for that economy.

This finding is consistent with economic theory and empirical literature. This finding is consistent with the results of Maqbool *et al.* (2013) on the determinants of unemployment

in Pakistan. The results of that study revealed an inverse and statistically significant relationship between unemployment and inflation both in short and long-run. It is also in line the findings of Eita and Ashipala (2010) on the determinants of unemployment in Namibia.

The effect of South African democratization in 1994 on Swaziland's unemployment was tested in this study. Swaziland (which shares border with South Africa) was considered as a good place for business compared to South Africa. Most companies or businesses were not enthusiastic to invest in South Africa (prior to 1994) because of its apartheid governance policy. Swaziland was considered as an alternative destination for investment. This contributed positively to the economy of Swaziland and jobs were generated. The democratization of South Africa in 1994 caused business to consider South Africa as investment destination. This was to the detriment of Swaziland. The results of this study confirmed that democratization of South Africa in 1994 impacted negatively on employment generation in Swaziland. The global economic crisis of 2007-2009 worsened unemployment in Swaziland. This is consistent with the theoretical and empirical literature, for example, Otobe (2011) found that labour-intensive sectors such as manufacturing for export which had been one of the fundamental drivers of the increase in women's wage employment opportunities were adversely affected in the global economic downturn of 2007 -2009. This study was conducted on developing countries in Africa and Asia. The results are also in support of the findings of Choudhry *et al.* (2010) which found that the global economic crisis had negative effect on employment and worsened unemployment in both developed and developing countries.

The coefficient of government spending is not consistent with most empirical findings. An expansionary fiscal policy (through increase in government spending) is expected to reduce unemployment. However, the results of this study show that an increase in government spending causes unemployment to increase. This suggests that a greater proportion of government expenditure was dedicated to activities that do not generate employment.

CONCLUSION

The results indicate that an increase in the ratio of actual to potential GDP increases, unemployment will decrease. The effect of inflation on unemployment is negative but statistically insignificant and this suggests that there is weak evidence of Phillips curve in Swaziland. An increase in government expenditure resulted in a rise in unemployment. This may suggest that a greater proportion of government expenditure was not devoted to activities that generate more jobs. The democratization of South Africa in 1994 and global economic crisis of 2007-2009 impacted negatively on the economy of Swaziland and caused unemployment to rise.

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