THE EFFECT OF ECONOMIC GROWTH ON UNEMPLOYMENT IN SOUTH AFRICA: 1994-2012

Thandiwe M. Zulu[1], Joseph K. Mokoena[2], Amina F. Nyathi[3], Peter O. Dlamini[4]

[1] *Department of Economics, University of Cape Midlands, South Africa*
[2] *School of Economic Policy, Southern Africa Institute of Development Studies, Pretoria, South Africa*
[3] *Department of Econometrics, East African Graduate School of Economics, Nairobi, Kenya*
[4] *Centre for Labour Market Analysis, Johannesburg, South Africa*

**** Corresponding Author:***
Thandiwe M. Zulu
Department of Economics, University of Cape Midlands, South Africa
Email: thandiwe.zulu@ucm.ac.za

Abstract

Unemployment remains one of the most critical challenges confronting the South African economy, with fluctuations observed over recent years. This study examined how economic growth influences unemployment by analyzing quarterly time series data from South Africa spanning 1994 to 2012. Johansen cointegration results demonstrated the presence of a long-term equilibrium relationship among the variables. To evaluate the influence of macroeconomic factors—specifically REER, LP, GDP, and BUG—on unemployment, the research employed a vector error correction model (VECM). Findings from the VECM revealed that GDP, BUG, and REER exert a positive long-run effect on unemployment, whereas LP has a negative impact. The study concludes with policy suggestions: the South African government should focus spending on initiatives that foster both direct and indirect job creation, establish a favorable environment and flexible labor regulations to support employment growth, and emphasize labor-intensive industries. These measures would aid in absorbing a significant portion of the unemployed population, ultimately reducing unemployment rates in South Africa.

1. Introduction

South Africa is one of the African nations richly endowed with vast resources, including both human capital and mineral wealth. However, due to factors such as rising corruption, extensive mismanagement, and unfavorable policies enacted by various governments over the years, these abundant resources have not been effectively or optimally utilized. For instance, Faul (2013) highlights a controversial case involving the misappropriation of public funds amounting to nearly 250 million rands, which was spent on renovating President Zuma's private residence in his home village. Osinubi (2005) emphasizes that resources must be fully exploited and channeled towards profitable investment opportunities to maximize economic gains. Failure to allocate resources properly often results in persistent challenges such as unemployment and poverty (Osinubi, 2005). This is indeed the case in South Africa, where chronic unemployment remains one of the most significant problems, exhibiting a persistent upward trend over recent years (Berkowitz, 2011). Unemployment is a deeply undesirable phenomenon as it contributes significantly to widespread poverty and income inequality within the country. Furthermore, high levels of unemployment and poverty have also been linked to sharp increases in crime rates, deteriorating health conditions, and social unrest, among other negative consequences.

The unemployment situation in South Africa is highly visible and well-documented, as evidenced by the growing number of school leavers and university graduates who are unable to secure suitable employment, often ending up in jobs that do not fully utilize their qualifications or skills. According to Isobel (2006), the chronic nature of South African unemployment is underscored by the fact that many of the unemployed have never had formal employment before. Additionally, a significant proportion of those actively seeking employment have been searching for jobs for more than three years without success. The total labor force, or economically active population, in South Africa includes all individuals between the ages of 15 and 64 who are either employed or unemployed but actively looking for work. Youths constitute a large segment of this unemployed population. Lings (2012) reports that the first quarter 2012 Labor Force Survey (LFS) by Statistics South Africa revealed there were approximately 32.786 million people aged 15 to 64 years, representing an increase of 116,000 relative to the fourth quarter of 2011 and an annual increase of 472,000. The number of economically active individuals was 17.948 million, up by 207,000 compared to Q4 2011 and by 466,000 year-on-year. Of this group, 13.497 million were employed, reflecting a decline of 75,000 from the previous quarter but an increase of 304,000 compared to the same quarter the previous year. Conversely, the number of unemployed rose to 4.526 million, representing an increase of 282,000 compared to Q4 2011 and 162,000 year-on-year (Lings, 2012). Understanding unemployment requires an examination of its various types, classified primarily by their causes: seasonal, structural, frictional, and cyclical unemployment. In South Africa, structural unemployment is the most prevalent type, which occurs when there is a fundamental shift in the industrial structure or the economic activities within the country (Njoku and Ihugba, 2011). Factors contributing to rising unemployment include rapid technological advancements, inflation, economic recessions, and changing consumer preferences. Smit, Mostert, and Oosthuizen (2006) observe that the South African economy has undergone swift technological changes, leading many industries to become more capital-intensive, thereby causing structural unemployment as fewer workers are needed. Moreover, structural unemployment arises due to a mismatch between workers' skills and the demands of available jobs.

Another form is seasonal unemployment, which occurs due to fluctuations in industry activity driven by seasonal changes, climate variations, or the natural characteristics of certain industries (Njoku et al., 2011). For example, in the agricultural sector of South Africa, farm laborers in vineyards located in the Western Cape are often classified as seasonal workers. These workers experience high demand during harvesting periods but face unemployment during off-season times. Frictional unemployment exists when there is unsatisfied labor demand because unemployed workers lack the necessary skills or are unaware of available job opportunities. This type of unemployment is common among unskilled laborers in South Africa who frequently migrate from one area to another due to limited access to communication infrastructure such as telephones, internet, and employment centers (Mafiri, 2002). Cyclical unemployment, also referred to as Keynesian unemployment, stems from insufficient aggregate demand in the economy. During recessionary periods, business activities decline, leading to layoffs and higher unemployment rates. Mafiri (2002) further explains that in South Africa, cyclical unemployment is complicated by its coexistence with large-scale structural unemployment, making it more challenging to tackle. Many of the socio-economic problems South Africa faces today, including unemployment, poverty, and income inequality, have roots in the apartheid era and continue to shape development policies in the post-apartheid period. The democratic transition in 1994 raised expectations among previously disadvantaged populations for improved living standards and greater economic opportunities. Chikulo (2003) notes that the new government, in an effort to reduce socio-economic disparities and meet these high expectations, prioritized rapid socio-economic development with a focus on reducing unemployment, poverty, and income inequality as key objectives. Consequently, the government introduced several development policies and strategies, such as (1) the Reconstruction and Development Program (RDP), (2) the Growth, Employment and Redistribution Policy

(GEAR), (3) the Accelerated and Shared Growth Initiative for South Africa (ASGISA), and (4) the Joint Initiative for Priority Skills Acquisition (JIPSA). These initiatives were designed to address the persistent challenges of chronic unemployment, poverty, and income inequality.

From a theoretical standpoint, economic growth is widely considered the primary tool for reducing unemployment and poverty, as well as for improving living standards. Kreishan (2011) asserts that an increase in the rate of GDP growth typically leads to higher employment levels and thus lowers unemployment. This widely accepted economic theory, known as Okun's Law, describes the empirical relationship between output growth and unemployment reduction and has been validated in numerous countries, particularly developed economies (Lee, 2000; Fariso & Quade, 2003; Daniels & Ejara, 2009). However, Osinubi (2005) points out that while economic growth is necessary for reducing unemployment and poverty, it is not sufficient on its own. Economic growth must be complemented by policies that encourage investment in job-creating programs to stimulate growth and effectively address poverty and unemployment. Therefore, a comprehensive approach involving both growth and targeted employment policies is essential to tackle these socio-economic challenges in South Africa.

Statement of the Problem

The shift from apartheid to democracy in South Africa marked the beginning of efforts aimed at economic redress to address the deep-rooted social and economic legacies left by apartheid, including high unemployment, income disparities, and poverty. Following the historic 1994 elections, there was a surge of hope and high expectations among the majority of South Africans who had been previously marginalized. They anticipated that the newly elected government would be able to reduce unemployment, narrow income inequality, and alleviate poverty (Chikulo, 2003). However, more than a decade after the first democratic elections, unemployment remains persistently high and continues to pose a significant challenge for South Africa. Unemployment is among the most critical issues affecting the South African economy, with rates showing fluctuations over recent years. According to Quantec (2015), official unemployment figures stand at approximately 24.5%. It is clear that high unemployment is a stark reality in the country, with the majority of those unemployed belonging to the black population. Kingdon and Knight (2007) highlight several socio-economic consequences of unemployment in any nation, noting that it leads to the depletion of human capital, social marginalization, civil unrest, elevated crime rates, and worsened health outcomes. Moreover, unemployment fuels poverty and exacerbates income inequality, thereby deepening the divide between the wealthy and the poor within the nation. Consequently, the South African government continues to grapple with the challenge of unemployment, seeking policies that stimulate job creation. By implementing measures that foster a favorable environment for employment growth, it is believed that the unemployment crisis can be mitigated. Many developing and underdeveloped countries struggle with persistent unemployment and insufficient job opportunities. In South Africa, the rate of employment generation has consistently failed to keep pace with the expanding labor force over recent years. When a nation experiences economic growth that does not translate into proportional increases in employment, this phenomenon is referred to as "jobless growth." Biyase and Bonga-Bonga (2010) report that the concept of "jobless growth" has been widely debated among economists and policymakers, who express concern over South Africa's apparent inability to convert economic growth into job creation. This situation underscores the need to explore the influence that economic growth has on unemployment within the South African context.

Research Objectives

The primary aim of this study is to examine how economic growth impacts unemployment in South Africa. To achieve this overarching goal, the study focuses on the following specific objectives:

- To analyze the patterns and trends of economic growth and unemployment in South Africa since 1994.
- To investigate the nature of the relationship between economic growth and unemployment in the country.
- To propose policy recommendations that encourage economic growth while reducing unemployment levels in South Africa.

Research Hypothesis

This study tests the following hypotheses:

H0: Economic growth does not have a significant negative effect on unemployment in South Africa.

H1: Economic growth has a significant negative effect on unemployment in South Africa.

2. Literature Review

A vast amount of literature addresses the topic of unemployment and economic growth. This study is grounded on several key theories regarding unemployment—namely, the Classical and Keynesian theories—as well as theories of economic growth, specifically the Neoclassical and Endogenous growth theories. The Classical theory argues that any unemployment present in the economy is temporary and that free market mechanisms will automatically restore full employment. Conversely, the Keynesian theory posits that unemployment results from a shortfall in aggregate demand (Keynes, 1936). Accordingly, Keynes advocated for government intervention through expansionary fiscal or monetary policies to mitigate or eliminate involuntary unemployment in the economy. The Neoclassical growth theory, illustrated by the Solow-Swan model, suggests that the steady-state growth rate is determined externally by technological progress. Aghion and Howitt (1997), building on the Solow-Swan framework, contend that without technological advancements, diminishing returns to capital accumulation would eventually halt economic growth. Trpkova and Tashevska (2011) highlight that endogenous growth models place significant emphasis on the roles of human capital development and innovation capacity in driving economic growth. Endogenous growth theorists thus argue that sustained economic growth is generated from factors internal to the economy. Numerous empirical studies have explored the relationship between economic growth and unemployment, but results vary widely depending on the econometric methods, countries studied, data sets, and time periods involved. Studies by Walterskirchen (1999), Swane and Vistrand (2006), and Yerdelen Tatoglu (2011) investigated this relationship primarily in developed countries. In the context of developing countries, relevant studies include those by Hussain, Siddiqi, and Iqbal (2010), Aktar and Ozturk (2009), and Sodipe and Ogunrinola (2011). Within South Africa, researchers such as Biyase and Bonga-Bonga (2010), Mahadea (2003), Burger and Von Fintel (2009), as well as Kingdon and Knight (2007) have examined the influence of economic growth on unemployment and the dynamics between these variables.

3. Methodology

To evaluate the effect of economic growth on unemployment in South Africa, this study employs a vector autoregression (VAR) framework. Initially, the data series undergo stationarity testing using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Subsequently, the Johansen cointegration approach (Johansen, 1991, 1995) is applied to assess the existence of a long-term relationship among the variables. The vector error correction model (VECM) is then utilized to estimate the long-run parameters and capture the speed of adjustment towards equilibrium. Various diagnostic tests are performed to verify the model's stochastic properties, including checks for heteroskedasticity (White test), normality of residuals (Jarque-Bera test), and serial correlation (Lagrange Multiplier test). Additionally, the study applies impulse response functions and variance decomposition techniques to illustrate how unemployment responds to shocks from the macroeconomic variables incorporated in the VAR model. These analyses reveal the share of forecast error variance in each variable explained by innovations in the others.

Model Specification

This research adapts the model proposed by Aktar and Ozturk (2009), which analyzed unemployment as a function of economic growth and foreign direct investment in Turkey. Their model is expressed as:

$$UR_t = f(GDP_t, EXP_t, FDI_t), \quad (1)$$

where UR_t denotes the unemployment rate, GDP_t, is gross domestic product, EXP_t represents exports, and FDI_t stands for foreign direct investment, all measured over time t.

In this study, the model is extended by including three additional variables: government budget deficit, labor productivity, and real effective exchange rate (REER). Thus, the modified empirical model is expressed as:

$$UR_t = \beta_0 + \beta_1 GDP_t + \beta_2 REER_t + \beta_3 BUG_t + \beta_4 LP_t + \varepsilon. \quad (2)$$

where UR_t is unemployment, GDP_t represents economic growth $REER_t$ is the real effective exchange rate, BUG_t is the budget deficit, and LP_t denotes labor productivity.

All variables are transformed into natural logarithms to reduce the influence of outliers and to interpret the coefficients as elasticities. Therefore, the model to be estimated is:

$$InUR_t = \beta_0 + \beta_1 InGDP_t + \beta_2 InREER_t + \beta_3 InBUG_t + \beta_4 InLP_t + \varepsilon_t, \quad (3)$$

where $InUR_t$ is the natural logarithm of unemployment rate (strict definition); $InGDP_t$ proxies' economic growth; $\beta_2 InREER_t$ measures the real effective exchange rate in foreign currency terms; $InBUG_t$ represents the budget deficit; and $InLP_t$ stands for labor productivity. The coefficients β_0, β_1, β_2, β_3, and β_4 represent the intercept and parameter estimates, with ε_t,as the error term.

Data Sources

This study utilizes quarterly time series data from South Africa, covering the period 1994 to 2012. The dataset includes real GDP, unemployment rate, real effective exchange rate, government deficit, and labor productivity. Data were sourced secondarily from electronic databases of the South African Reserve Bank (SARB), Statistics South Africa (Stats SA), and Quantec. The selected period captures the post-apartheid era, during which various economic policies and development programs were implemented to address unemployment and other socio-economic challenges inherited from apartheid.

Estimation Techniques

To ensure the validity of the time series data for regression analysis, this study conducts stationarity tests using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Gujarati (2004) emphasizes that regressing non-stationary series on each other may result in spurious regression, producing misleading inference. Therefore, confirming stationarity is critical to avoid invalid statistical results. Furthermore, results from non-stationary series are only applicable to the sample period and cannot be generalized to other periods, thus limiting their forecasting usefulness (Gujarati, 2004).

4. Results and Discussion

Unit Root Test Results

The results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are summarized in Table 1. The findings indicate that most variables do not pass the stationarity tests at their level form, except for the real effective exchange rate (REER) and government budget deficit (BUG). Specifically, the null hypothesis of the presence of a unit root—indicating non-stationarity—could not be rejected for these variables when tested at their levels. This implies that they are non-stationary in levels and need to be differenced to achieve stationarity. Conversely, the variables representing gross domestic product (GDP), labor productivity (LP), and unemployment rate (UN) only become stationary after applying the first difference transformation. The rejection of the null hypothesis for these variables at the first difference level supports the alternative hypothesis that these series are integrated of order one, I(1). Thus, all variables in the study are integrated of the same order, I(1), indicating that they require first differencing to achieve stationarity and are suitable for subsequent cointegration analysis.

Table 1. Unit root tests results

		Augmented Dickey-Fuller (ADF)		Phillips Peron (P-P)	
Order of integration	Variable	Intercept	Trend and intercept	Intercept	Trend and intercept
Level 1st differenced	*LUN*	-2.428105	-2.163671	-2.387832	-2.002433
	DUN	-8.600376***	-8.787136***	-10.51225***	-11.32200***
	LGDP	-0.767991	-2.322597	-0.588012	-5.134607***
	DGDP	-2.859157*	-2.827792	-18.97381***	
	LREER	-2.767420*	-3.715454**	-2.758381*	-2.709520
	DREER	-9.452219	-9.389639***	-9.454330	-9.391353***
	LLP	-0.718396	-4.318353*	-0.698362	-3.403712*
	DLP	-6.868514***		-6.917136***	-6.876002***
	LBUG	-1.863169	-1.576961	-6.247430***	-6.227271***
	DBUG	-3.215054**	-3.446540*		
1%	Critical value	-3.520307	-4.094550	-3.520307	-4.085092
5%		-2.900670	-3.475305	-2.900670	-3.470851
10%		-2.587691	-3.165046	-2.587691	-3.162458

Notes: ***represent stationary variables at 1% significance level, ** represent stationary at 5% and * represent stationary variables at 10%.

Cointegration Test Results

Following the confirmation that the variables are stationary, the next step involves conducting cointegration tests to determine whether a long-run relationship exists among the variables. The main objective of performing cointegration analysis in this study is to investigate whether there is a long-term equilibrium association between unemployment and the explanatory variables, namely GDP, REER, LP, and BUG. Establishing this relationship is crucial for deriving meaningful economic interpretations based on the test results. For the cointegration test, this study adopts Johansen's (1991, 1995) maximum likelihood approach. Prior to estimating the long-run and short-run coefficients, the Johansen methodology requires specifying the appropriate lag length and the deterministic trend assumption for the Vector Autoregression (VAR) model. To determine the optimal lag length, the study employs the information criteria method, which guides the selection process. Table 2 presents the lag lengths suggested by various information criteria used in this analysis.

Table 2. Lag selection criterion

Lag	Log*L*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-776.5719	NA	3433.208	22.33063	22.49123	22.39442
1	-493.8867	516.9102	2.183465	14.96819	15.93183	15.35096
2	-461.3659	54.82071	1.780788	14.75331	16.51999	15.45506
3	-400.2641	94.27131	0.652822	13.72183	16.29154	14.74255
4	-318.5443	114.4078	0.136296	12.10126	15.47401*	13.44096
5	-265.6853	66.45131*	0.067368*	11.30529	15.48107	12.96396*
6	-238.9146	29.83017	0.073869	11.25470*	16.23351	13.23235

Notes: *indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion.

Table 2 presents the lag order selection statistics. In this study, a maximum of six lags was allowed to provide enough flexibility for the model to adjust and to ensure well-behaved residuals. The lag length selection criteria summarized in Table 2 indicate that lag 5 was chosen by several criteria, including the Likelihood Ratio (LR), Final Prediction Error (FPE), and Hannan-Quinn (HQ) criteria. However, when lag 5 was used, the Vector Error Correction Model (VECM) estimates were spurious, evidenced by a positive and statistically insignificant coefficient of the error correction term. Consequently, lag 4 was selected as the optimal lag length for the data. Subsequently, the Johansen cointegration test was conducted using a lag length of 4 in the Vector Autoregression (VAR) model. The cointegration rank can be tested using both the trace test and the maximum eigenvalue test statistics. Since these two tests may sometimes yield conflicting results, Alexander (2001) recommends placing more trust in the trace test, as it tends to be more robust in determining cointegration. The outcomes of these cointegration tests are shown in Tables 3 and 4 below.

Table 3. Unrestricted cointegration rank tests (trace) results

Hypothesized number of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
None*	0.391669	79.70581	68.81889	0.0066
Hypothesized number of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
At most 1	0.283952	42.92512	47.856143	0.1344
At most 2	0.164315	18.20856	29.7977	0.5507
At most 3	0.064359	4.925260	15.49471	0.8167
At most 4	3.42E-05	0.002528	3.841466	0.9575

Note: Trace test indicates 1 cointegration eqn(s) at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level. ** MacKinnon-Haug-Michelis (1999) p-values.

Table 4. Unrestricted cointegration rank test (maximum eigenvalue) results

Hypothesized number of CE(s)	Eigenvalue	Ma-eigenvalue statistic	0.05 critical value	Prob.**
None*	0.391669	36.78069	33.87687	0.0066
At most 1	0.283952	24.71656	27.58434	0.1344
At most 2	0.164315	13.28330	21.13162	0.5507
At most 3	0.064359	4.922732	14.26460	0.8167
At most 4	3.42E-05	0.002528	3.841466	0.9575

Notes: Max-eigenvalue test indicates 1 cointegration eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **
MacKinnon-Haug-Michelis (1999) p-values.

The outcomes of both the trace and maximum Eigenvalue tests presented in Table 3 and Table 4 indicate that at the 5% significance level, there is at least one cointegrating equation. According to the trace test, the null hypothesis of no cointegration is rejected because the test statistic value of 79.70581 exceeds the 5% critical threshold of around 68.81889. However, when testing the null of one cointegrating vector, the trace test fails to reject it since the test statistic of 42.92512 falls below the 5% critical value of 47.856143. This suggests that exactly one cointegrating relationship exists at the 5% level. Likewise, the maximum Eigenvalue test in Table 4 supports these results as it also rejects the null of no cointegration. Yet, for the null hypothesis of one cointegrating vector, it fails to reject since the max-Eigen statistic of 24.71656 is under the 5% critical value of approximately 27.58434. Both tests, therefore, agree on the presence of one cointegration vector. As a result, the study infers that a meaningful and steady long-term association exists among the variables, particularly between unemployment and the other included variables, which are GDP, REER, LP, and BUG.

Vector Error Correction Model (VECM):

Since variables may affect outcomes in the short and long term, the study adopted a vector error correction model (VECM) to separate those effects. The VECM framework serves the function of distinguishing between short-run dynamics and long-run equilibrium effects among variables in the unemployment model. Based on the cointegration findings, the VECM specification was developed, and its estimation results are presented in Table 5 and Table 6.

Table 5. Long-run cointegration equation results

Variables	Coefficient	Standard error	*t*-statistic
Constant	-286.3074		
UN(-1)	1.000000	-	-
GDP(-1)	19.49725	21.4227	0.91012
REER(-1)	0.446199	0.05322	8.38481
LP(-1)	-0.288840	0.19680	-1.46771
BUG(-1)	0.609186	0.21191	2.87472

The findings presented in Table 5 above demonstrate the long-run effects of the explanatory variables—GDP, REER, LP, and BUG—on unemployment in South Africa, expressed in the following equation:

$$UN = –286.307 + 19.497GDP + 0.446REER – 0.289LP + 0.609BUG \quad (4)$$

Equation 4 shows that GDP, REER, and BUG exhibit a positive long-term relationship with unemployment. Notably, REER and BUG are statistically significant in accounting for changes in unemployment, as their absolute t-statistics exceed the value of 2. These findings imply that a one percent increase in REER (indicating appreciation) raises unemployment by roughly 0.446 units, suggesting that currency appreciation hampers long-term job creation. Similarly, a one percent rise in GDP corresponds to an estimated 19.497 increase in unemployment. Typically, economic growth is expected to reduce unemployment. However, when growth occurs without a corresponding increase in employment, it is termed “jobless growth”. Mahadea (2003) reached comparable conclusions and pointed out that South Africa experienced periods of positive economic growth accompanied by stagnating or falling employment levels. These findings reinforce the jobless growth hypothesis, which argues that economic expansion in South Africa is not successfully translating into employment gains.

Additionally, Equation 4 reveals that labor productivity (LP) is the only variable showing a negative long-term link with unemployment. The results indicate that a one percent improvement in LP leads to an approximate decrease in unemployment by 0.289. This outcome aligns with economic theory—specifically, the marginal productivity theory—which posits that increasing the marginal productivity of labor encourages businesses to hire more workers, hence the negative association between LP and unemployment. Lastly, the model also suggests that a one percent increase in the budget deficit (BUG) contributes to a rise in unemployment by about 0.609 percent.

Table 6. Error correction results

Variable	Coefficient	Standard error	*t*-statistic
D(UN)	-0.431765	0.15212	-2.83832
D(GDP)	0.002450	0.00073	3.34783
D(REER)	-1.070730	0.57300	-1.86863
D(LP)	0.671146	0.19927	3.36797
D(BUG)	0.440239	0.13679	3.21832

The results reveal that the coefficient of the differenced dependent variable (UN) is -0.431765, which suggests that the adjustment speed toward equilibrium is about 43.177%. This indicates that when there is a deviation from the long-run equilibrium, approximately 43.177% of the imbalance in unemployment is corrected within one year as the system moves back toward stability. Moreover, the findings indicate that GDP, budget deficit (BUG), and labor productivity (LP) are statistically significant in explaining the unemployment model in South Africa. This is supported by their absolute t-statistic values being greater than 2. In contrast, the real effective exchange rate (REER) is the only variable found to be statistically insignificant, as its absolute t-statistic value falls below 2. The relatively slow adjustment rate of unemployment suggests that there may be other influential factors affecting unemployment in South Africa beyond the variables considered in this model—namely, GDP, REER, LP, and BUG. These could include variables such as monetary policy stance, educational attainment, or demographic characteristics. The error correction mechanism further reveals the following short-run dynamics: a one percent increase in GDP leads to an estimated 0.00245 rise in unemployment. Among the explanatory variables, REER is notable for its role in reducing unemployment. Specifically, a one percent increase in REER (i.e., a depreciation of the domestic currency) results in a 1.0707 percentage point decrease in unemployment. Conversely, an increase of one percent in the budget deficit (BUG) raises unemployment by approximately 0.4402. Additionally, labor productivity (LP) appears to increase unemployment in the short term, as a one percent rise in LP corresponds to an increase of roughly 0.6711 in the unemployment rate. In summary, these results suggest that, in the short run, GDP, LP, and BUG exert upward pressure on unemployment, whereas a depreciation in the exchange rate (REER) helps reduce it.

Diagnostic Checks

To ensure the validity and reliability of the estimated parameters from the unemployment model, this study conducted a series of diagnostic checks. Specifically, three tests were applied: the Lagrange Multiplier (LM) test for serial correlation, the White test for heteroskedasticity, and the Jarque-Bera (JB) test to examine the normality of residuals.

Table 7. Diagnostic checks results

Test	Null hypothesis	*t*-statistic	Probability
Langrage multiplier (LM)	No serial correlation	30.03959	0.2228
White (CH-sq)	No conditional heteroskedasticity	32.39	0.0657
Jarque-Bera (JB)	There is a normal distribution	2.000358	0.3678

Table 7 presents the outcomes of the diagnostic evaluations conducted on the unemployment model. These results indicate that the model does not suffer from serial correlation or conditional heteroskedasticity, and that the residuals follow a normal distribution pattern.

Impulse Response Analysis

The impulse response function depicted in Figure 1 illustrates how unemployment dynamically responds to a one-time standard deviation shock in each of the system's variables, tracing both the direction and duration of these responses over a 10-year horizon. The findings reveal that although all variable shocks significantly impact unemployment, their effects are not long-lasting.

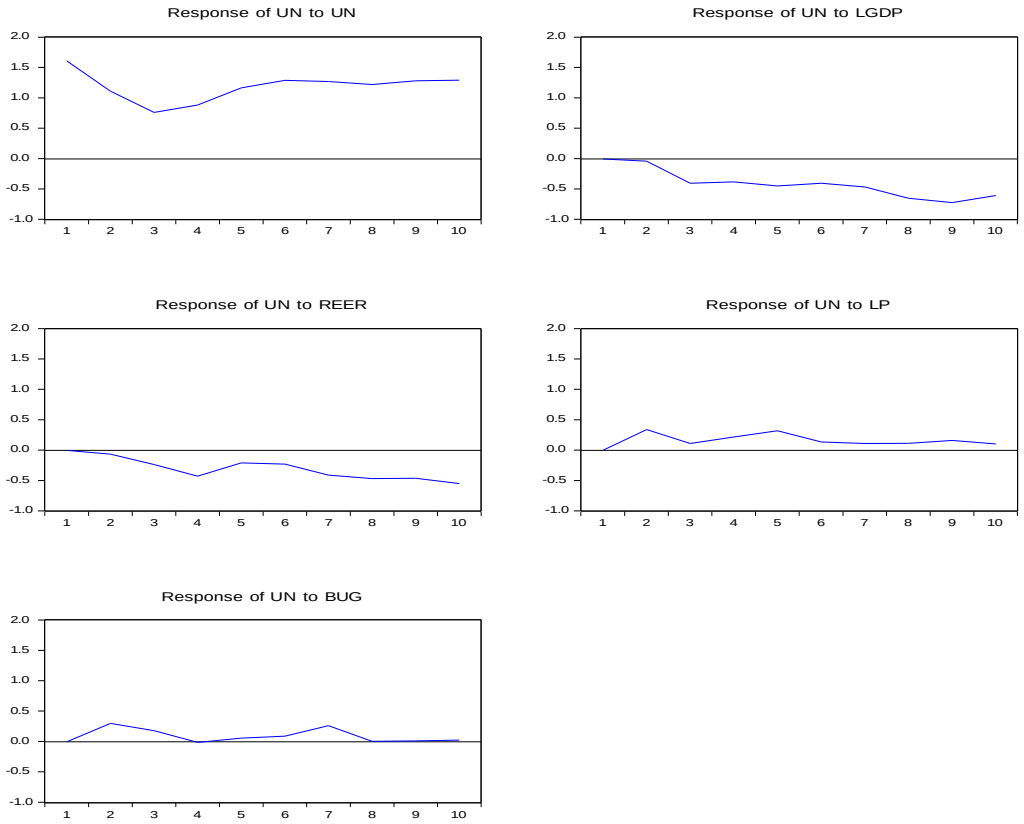

Fig. 1. Impulse response analysis

A one-period standard deviation shock to GDP causes a slight reduction in unemployment beginning in year 2, with the effect fading around year 3. Similarly, a shock to REER leads to a drop in unemployment from year 2, but the impact wears off by year 4. A shock to labor productivity (LP) increases unemployment starting around year 2.5, peaking near year 5, and then gradually stabilizing. The shock to the budget deficit

(BUG) shows more volatility. In the first year, BUG increases unemployment, then from years 2 to 4 it reduces it, followed by alternating increases and decreases in subsequent years until the effect levels out by year 8. These patterns indicate that increases in GDP and REER are associated with temporary reductions in unemployment.

Variance Decomposition Analysis

Table 8 outlines the variance decomposition results, which assess the proportion of forecast error variance in unemployment attributed to its own shocks and those of other macroeconomic indicators. To evaluate the medium-to-long-term effects of macroeconomic variables on unemployment, a variance decomposition was performed over a 10-year timeframe. In year 1, the entirety of the variance in unemployment is explained by its own shocks. By year 5, unemployment accounts for 89.9% of the forecast variance in its own rate, while the remaining 10.1% is attributed to other macroeconomic variables. Specifically, GDP contributes 2.2%, REER contributes 6.3%, LP accounts for 0.8%, and BUG also contributes 0.8%. By the 10th year, unemployment's own innovations explain 82.6% of its variation, while external macroeconomic factors collectively account for 17.4%. These results imply that although unemployment is largely self-determined, the role of other macroeconomic indicators becomes more significant over time.

Table 8. Variance decomposition analysis

Period	S.E	UN	GDP	REER	LP	BUG
1	1.618645	100.0000	0.000000	0.000000	0.000000	0.000000
2	2.027540	97.58766	0.041872	1.084248	0.978441	0.307777
3	2.236812	94.53660	1.889359	2.147652	1.123338	0.303053
4	2.469642	91.06957	2.365353	4.879436	0.965459	0.720181
5	2.751803	89.88171	2.185862	6.345907	0.801644	0.784875
6	3.018546	89.00134	1.992610	7.604249	0.749033	0.652765
7	3.259969	86.55277	3.010587	9.60292	0.792391	0.583959
8	3.485668	84.42575	3.760189	9.995544	1.113898	0.704624
9	3.718823	83.28991	3.968913	10.67858	1.243145	0.819443
10	3.947862	82.58663	3.893820	11.40881	1.350019	0.760721

The influence of GDP rose to 3.90%, while REER's contribution increased to 11.4%. Labor productivity (LP) rose to 1.4%, whereas BUG's influence declined slightly to about 0.76%. These findings align with established economic theory, which suggests that macroeconomic shocks—particularly from GDP, REER, LP, and BUG—continue to significantly explain fluctuations in unemployment.

5. Conclusions and Recommendations

This study was driven by the increasing significance of understanding the link between unemployment and economic growth in developing nations. Despite this relevance, there remains limited research on the unemployment-growth relationship within the African context. South Africa, in particular, faces persistent job scarcity and erratic unemployment rates over the years, prompting economists and policymakers to identify root causes and design strategies to address the crisis. Based on the findings, several policy recommendations can be proposed to help reverse the ongoing high unemployment trends. These suggestions aim to substantially support job creation in South Africa. Post-apartheid, the South African government enacted numerous laws that altered labor market institutions. Arora and Ricci (2006) note that some of these labor practices—especially regulations concerning collective bargaining, labor standards, and workplace conditions—have added rigidity to the labor market, inadvertently exacerbating unemployment. These institutional changes have also raised employer costs, further discouraging hiring.

An essential point highlighted in this study is that tackling unemployment cannot be the sole responsibility of the government. Instead, the government must foster a business-friendly environment and enact more flexible labor policies. This can attract private sector investment and support small enterprises, thereby integrating established entrepreneurs with emerging ones to generate more jobs and absorb the surplus labor force. Achieving robust economic growth and quality employment continues to be a critical challenge for South Africa. The research demonstrated that economic growth plays a crucial role in reducing unemployment. However, to attain meaningful growth that stimulates labor demand and decent job creation, policymakers must implement strategies that drive and sustain accelerated growth. The analysis showed that a 1% increase in the budget deficit (BUG) raises unemployment by approximately 0.609%. This contrasts with views of some economists and decision-makers who endorse deficit spending to stimulate employment. To better address joblessness, this study recommends that the government redirect expenditures towards sectors that directly or indirectly foster employment—such as healthcare, infrastructure, education, and job-generating programs. Even investments in crime prevention can enhance South Africa's image as a safe and attractive location for both domestic and international investors, further boosting employment prospects. Unemployment in South Africa has remained stubbornly high. Samson, Quene, and Niekerk (2001) argued that the country's production systems are largely capital-intensive and increasingly geared toward skilled labor. This presents a major challenge, as the bulk of the unemployed population lacks adequate skills. Therefore, employment strategies should prioritize sectors that are labor-intensive and capable of absorbing low- and semi-skilled workers.

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