

-RESEARCH ARTICLE-

## UNEMPLOYMENT AND ECONOMIC GROWTH IN SOUTH AFRICA FROM 1980 TO 2020 AN ARDL APPROACH

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### —Abstract—

This study investigates unemployment and economic growth in South Africa for the period from 1980 to 2020. The study seeks to investigate the nature of the relationship that exists between unemployment and economic growth in the short and long run. This study utilizes borrowed annual time series data collected from online secondary sources, that is, the World Bank, spanning a time period from 1980 to 2020. The results reveal that there is a negative, statistically insignificant relationship between unemployment and economic growth in South Africa. The Granger causality tests reveal that there is no causality between unemployment and economic growth in South Africa. The policy implication of this study is that the government must propose and implement policies that supports labour-intensive policies to reduce higher unemployment and increase economic growth in South Africa.

**Keywords:** Unemployment, Economic Growth, South Africa, Autoregressive Distributed Lag Model, Error Correction Model

JEL code: C32, C50, J20, J21

## 1. INTRODUCTION

The South African population is 6,0 041,994 people as per information published by the StatsSA in 2021. The population has been gradually increasing from 1960 to 2021 at a

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rate of 1.28% per year and job opportunities have not correspondingly increased to meet the growth in labour force. South Africa has the highest unemployment rates in the world, both in rural and urban areas having been characterized by low economic growth, high poverty rate and high inequality levels. According to [StatsSA \(2021c\)](#), the results of the Quarterly Labour Force Survey (QLFS) for the second quarter of 2021 show that the number of employed people fell by 54,000 to 14.9 million. In the first quarter of 2021, the number of jobless people grew by 584, 000 to 7.8 million and that between the two quarters, the number of discouraged job seekers increased by 186,000 (5.9%) while the number of people not economically active decreased by 571,000 (4.5%) for reasons other than discouragement resulting in a net decrease of 386,000 in the not economically active population ([StatsSA, 2021c](#)). The significance of this study is that it shows the impact of unemployment on the growth of South African economy from 1980 to 2020 and its outcomes.

**Overview of the study:** [StatsSA \(2021b\)](#) highlights that in order to safeguard South African residents from the new Coronavirus, the government declared a national lockdown, causing the economy to shut down, leading to a shock in the labour market and a significant shift in the way individuals went about their jobs. This paradigm shift entailed questions as to whether people worked from home or their usual workplaces, whether they continued to receive salaries during the lockdown, whether they received full or reduced salaries, whether they expected to return to same jobs or businesses after the lockdown, and whether they expected to lose their jobs or that their businesses would close soon.

[StatsSA \(2021b\)](#) stresses that the lockdown resulted in salaries of workers being cut-off to balance the economic losses whereby those with higher education had higher chances of receiving full salaries than those with low levels of education in both, the first and second quarters of 2021. In the second quarter of 2021 about 9 out of every 10 employed graduates (94%) continued to get full wages compared to 86.5% of individuals with less than matric as their highest degree of education. The official unemployment rate grew in all nine provinces, with the Northern Cape recording the highest up by 4.7% points, followed by the Eastern Cape up by 3.3% and North West up by 3.0%. Free State had the smallest rise of 0.9%, followed by Gauteng and Limpopo, both which saw a 1% increase ([StatsSA, 2021b](#)). This can be seen in the information given in [Table 1](#) below.

According to [StatsSA \(2021a\)](#), the unemployment rate among women was 36.8% in the second quarter of 2021 compared to 32.4% for men. In the second quarter of 2021, employment in the formal sector fell by 375,000, while employment in other sectors increased. Employment in the formal sector rose by 184,000, in private households by 67,000, and in agriculture by 69,000. Between the first and second quarter of 2021, certain industries added jobs while others lost them, resulting in a net loss of 54,000 total jobs. Construction employment grew by 143,000, while other industries that added jobs included trade with 108,000, agriculture with 69,000, private homes with 67,000, and

transportation with 66,000 (StatsSA, 2021a). There have been job losses in finance with 278,000, community and social services with 166,000 and manufacturing with 83,000.

**Table 1: Unemployment Rate in South Africa by Province**

	Official Unemployment Rate				Expanded Unemployment Rate			
	Q1 2021	Q2 2021	Qtr-to-Qtr change	Year-on-year change	Q1 2021	Q2 2021	Qtr-to-Qtr change	Year-on-year change
South Africa	32.6	34.4	1.8	11.1	43.2	44.4	1.2	2.4
Western Cape	23.7	25.8	2.1	9.2	27.9	29.1	1.2	1.8
Eastern Cape	43.8	47.1	3.3	10.2	49.6	53.0	3.4	0.2
Northern Cape	23.4	28.1	4.7	3.0	42.2	50.3	8.1	5.2
Free State	35.6	36.5	0.9	11.2	43.4	45.2	1.8	4.0
Kwa-Zulu Natal	30.5	32.5	2.0	13.6	46.4	47.1	0.7	0.9
North West	32.2	35.2	3.0	13.6	47.2	46.9	-0.3	0.6
Gauteng	34.4	35.4	1.0	9.0	41.6	42.7	1.1	4.0
Mpumalanga	33.5	35.2	1.7	21.9	47.6	46.5	-1.1	1.1
Limpopo	29.4	30.4	1.0	8.5	49.5	49.9	0.4	3.4

**Source:** StatsSA

The North West province is known for its heavy reliance on the primary sector of agriculture and mining. It is divided in four district municipalities and 18 local municipalities. The district municipalities with their local municipalities are: Bojanala Platinum District (Moretele, Madibeng, Rustenburg, Kgetlengrivier and Moses Kotane local municipality), Dr Ruth Segomotsi Mompati District (Naledi, Mamusa, Greater Taung, Kagisano-Molopo and Lekwa-Teemane local municipality), Ngaka Modiri Molema District (Mahikeng, Ratlou, Tswaing, Ditsobotla and Ramotshere local municipality) and Dr Kenneth Kaunda District (JB Marks, Matlosana and Maquassi Hills local municipality). Mining is the mainstay of the North West province which generates more than half of the province's gross domestic product and provide jobs for a quarter of its workforce. Approximately 85% of the money-making activities take place in Klerksdorp and Potchefstroom, with the chief minerals of gold mined at Klerksdorp, platinum mined at Rustenburg and Brits, and diamonds mined at Lichtenburg, Bloemhof and Christiana.

## 2. LITERATURE

**Theoretical literature: Okun's hypothesis** - [Okun and Potential \(1962\)](#) propose Okun's Law, named after economist Arthur Melvin Okun, providing empirical evidence of the observed relationship between unemployment and growth in economics. He discovered that for every 1% increase in the unemployment rate, a country's GDP is approximately 2% lower than its potential GDP. This is known as the "gap version," and another version, the "difference version", describes the relationship between quarterly changes in unemployment and quarterly changes in GDP.

According to [Friedman and Wachter \(1974\)](#), there is a fixed relationship between changes in the unemployment rate and the size of the gap. Okun's law assumes that any change in productivity and labour force occurs at a constant exogenous trend rate over time. According to this theory, all variables should be excluded from a Cobb Douglas production function except the unemployment rate and the linear time trend, assuming that all variables are only functions of the unemployment rate and an exponential time trend.

**Pissarides and the job search theory** - [Pissarides and McMaster \(1990\)](#) and [Jackman et al. \(1990\)](#) created the first and most comprehensive set of work on the job-search model. The model is a neoclassical growth model with exogenous technology advancement as an extension. The search theory assumes that labour market activity is disorganized, time-consuming, and costly. Unemployed employees and the number of vacancies available on the market at any one time have been combined in a matching function. The matching function is believed to be concave, allowing it to represent an accumulation of externalities on the labour market.

The smaller the search effort of people looking for work, the more vacancies employers open; and vice versa, therefore, the more workers on the job market, the faster the matching process for firms. From a supply-side perspective, it has been discovered that growth rate is adversely associated with unemployment rate. On the demand side, an increase in growth rate results in a fall in capital ratio per unit of efficient labour, which leads to an increase in the interest rate. This has an impact on labour market tightness, which can be positive or negative depending on the difference between the interest rate and the pace of growth.

**Empirical literature:** This section reviews the studies conducted by different scholars from developed and developing countries as well as South Africa. The studies will be structured according to the studies that found a positive relationship, inverse relationship, no relationship, and nonlinear relationship among the variables.

**Studies that found a positive relationship:** By employing a VECM model, [Li and Liu \(2012\)](#) investigate the relationship between unemployment rate, economic growth and inflation in China utilizing annual time series data spanning for the period from 1978 to

2010. The empirical results revealed a positive relationship between unemployment rate and economic growth in the short run and recommends that labour resources should be optimized, improving employment rate and expansion of employment channels. Through employing an error correction model, [Akeju and Olanipekun \(2014\)](#) conducted a study on unemployment and economic growth in Nigeria, calling upon the government to promote economic growth in the country in order to promote employment for the people.

[Ademola and Badiru \(2016\)](#) employed an ordinary least squares method to investigate the impact of unemployment and inflation on economic growth in Nigeria for the period from 1981 to 2014. The empirical results reveal a positive relationship between unemployment and economic growth. The study recommends that the Nigerian government should embark on a policy to reduce the number of imported goods drastically and encourage local production that is labour-intensive in order to encourage domestic industries and reduce unemployment. [Ramzan \(2021\)](#) finds a positive insignificant impact of unemployment on the growth of Pakistan economy by employing an error correction model for the period spanning from 1980 to 2018.

**Studies that found a negative relationship:** By employing an ordinary least squares method, [Stephen \(2012\)](#) investigates the stabilization policy, unemployment crisis and economic growth in for the period from 1980 to 2008 and found that unemployment is detrimental to the growth and recommend that the government should undertake measures capable of creating jobs through industrialisation and mechanisation of agriculture. [Weir-Smith and Ahmed \(2013\)](#) investigate unemployment in South Africa by constructing a spatial-temporal understanding for the period from 1991 to 2007. According to them, unemployment showed a spatial pattern over time in South Africa and municipalities with high unemployment figures over time were spatially concentrated. The researchers recommend that unemployment interventions should be focused on local areas like municipalities or at least at a provincial level instead of nationally.

Through a panel approach, [Abdul-Khaliq et al. \(2014\)](#) investigates the relationship between unemployment and economic growth rate in 9 Arab countries for the period from 1994 to 2010 and results revealed a negative relationship between economic growth and unemployment, leading the author to the conclusion that an increase in economic growth reduces unemployment rate in these Arabian countries. By employing an ARDL model, [Shahid \(2014\)](#) investigate the effect of inflation and unemployment on economic growth in Pakistan for the period from 1980 to 2010 and results revealed a negative relationship between unemployment and economic growth in Pakistan for the period understudy and recommends that political stability, government expenditure, controlling population growth, proper education system and encouragement of self-employment are needed to help reduce unemployment.

By employing an ordinary least squares method, [Yelwa \*et al.\* \(2015\)](#) investigates the relationship between inflation, unemployment, and economic growth in Nigeria for the period from 1987 to 2012 and results revealed a negative relationship between unemployment and economic growth for the period under study. The researchers recommend that the Nigerian government must strive to fine-tune the macroeconomic policy instruments to achieve a sustainable and enabling environment that will enhance domestic output. [Imran \*et al.\* \(2015\)](#) conducted a panel study on unemployment and economic growth for the period from 1982 to 2011 for the selected 12 Asian countries and results revealed that unemployment reduces economic growth in the long run in these countries. The researchers recommend that reduction in unemployment rate would be a better option for more sustainable economic growth and for ensuring the welfare of the people.

[Dritsakis and Stamatiou \(2016\)](#) investigates the relationship between unemployment and economic growth in Greece by employing an ARDL model for the period from 1995 to 2015 and empirical results revealed a negative relationship between the variables both in the short and long run periods, recommending that the Greek government needs to develop proper economic policies to encourage self-employment and entrepreneurship with a view to overcome high unemployment rates and achieve stable growth rates in a steady and sustainable economic environment. [Dritsakis and Stamatiou \(2017\)](#) uses a panel approach to investigate into foreign direct investment, exports, unemployment, and economic growth of the new European members for the period from 1995 to 2013. The study employs panel estimation methods to analyse the relationship between the variables and found a negative relationship between unemployment and economic growth. The researchers recommend that governments of these countries stimulate exports and stabilize exchange rate in order to stimulate economic growth and help reduce unemployment.

[Misini and Badivuku-Pantina \(2017\)](#) investigates the effect of economic growth in relation to unemployment in Kosovo for the period from 2004 to 2014 by employing a simple linear regression and found that an increase in economic growth is detrimental to unemployment. The researchers recommend that the government should make radical changes in its approach towards economic growth by attracting foreign investments, stimulating business that employ more people and helping the agriculture sector to reduce unemployment. [NIKOLAOS and PAVLOS \(2018\)](#) investigates the causal nexus between foreign direct investment, exports, unemployment, and economic growth for the old European Union members for the period from 1970 to 2015 by employing a panel VAR model and Granger causality test. The results revealed a detrimental effect of unemployment on economic growth, showing that causality runs from economic growth to unemployment and recommending that encouragement of economic growth can help solve the problem of unemployment in these European Union members.



By employing an ARDL model, [Makaringe and Khobai \(2018\)](#) investigates unemployment effect on economic growth in South Africa for the period spanning from 1994 to 2016 and found a negative statistically significant relationship in both the short and long run period. The researchers recommend that the government needs to create a conducive environment and flexible labour market policies or legislations that incentivize many private sector and small businesses which will in turn consolidate the existing entrepreneurship activity with new entrepreneurs to create employment and absorb a large pool of unemployed population.

[Conteh \(2021\)](#) found that unemployment has a negative relationship to economic growth, both in the short and long run period for the period from 2001 to 2019. The researcher recommends that the Liberian government should redirect its spending toward activities that directly and indirectly promote the creation of employment and decent jobs through a conducive environment and flexible labour market policies that are labour intensive. [Adelowokan et al. \(2019\)](#) found a negative statistically significant relationship between unemployment and economic growth by employing an error correction model for the period from 1985 to 2015 in Nigeria.

[Kalu \(2021\)](#) found a positive relationship between female unemployment and economic growth, negative impact of youth unemployment on economic growth with male unemployment insignificantly affecting economic growth in Nigeria by employing an ARDL model for the period from 1981 to 2017. This highlights how the relationship between unemployment and economic growth can differ when it is analysed on a gender basis as opposed to the aggregate unemployment in the economy. [Louail and Benarous \(2021\)](#) found that the Okun's law is applicable in Algeria, recommending increased labour protection to mitigate adverse impact of unemployment on economic growth.

[Leasiwal \(2021\)](#) found out that an increase in economic growth reduces inflation in Maluku province in Indonesia for the period from 2007 to 2019. This offers insight on how the relationship might also be analysed on a provincial level as the effect might likely be different across the provinces. [Padder and Mathavan \(2021\)](#) found that unemployment and economic growth are inversely related in India for the period from 1990 to 2020, calling for the absorption of high labour pool by the government to reduce unemployment. [Prasetyo and Kistanti \(2020\)](#) recommends sustainable economic growth to reduce unemployment in Indonesia. [Dodds \(2020\)](#) also highlight that the key factor to drive economic growth is reduced unemployment.

A negative statistically significant relationship was found by [Shiyalini and Bhavan \(2021\)](#) in the long run in Sri-Lanka, emphasizing on how higher unemployment reduces the growth of the economy. [Priambodo \(2021\)](#) stress that unemployment negatively affects economic growth in Purbalingga Regency for the period from 2010 to 2019. [Sefidbari et al. \(2021\)](#) found bidirectional causality between unemployment and

economic growth in the case of Iran by employing a VAR model for the period from 2206 to 2016.

**Studies that found no relationship:** Kreishan (2011) investigates unemployment and economic growth in Jordan for the period from 1970 to 2008 and found that Okun's law cannot be confirmed in Jordan and that there is no relationship between unemployment and economic growth for the period under study. The researcher recommends that policy makers and regulators should ensure implementation of economic policies oriented towards structural change and reform in the labour market.

Sadiku *et al.* (2015) conduct an econometric estimation of the relationship between unemployment rate and economic growth of Macedonia for the period from 2000 to 2012. By employing a VAR model, ECM model and Granger causality tests, the results reveal that there is no relationship between unemployment and economic growth, recommending that economic policies should be directed in a way as to encourage employers to hire more workers during periods of expansions and crack on informal employment in order to positively contribute to economic growth. Omara (2021) found no causal relationship between unemployment and economic growth in Uganda and recommends that government should enable an environment that favours investment so it can reduce unemployment through absorption of the labour force.

**Studies that found nonlinear relationship:** Phiri (2014) investigated a nonlinear cointegration between unemployment and economic growth in South Africa for the period from 2000 to 2013. By employing a momentum threshold autoregressive (MTAR) model, the results revealed that a nonlinear relationship exists between unemployment and economic growth and that unemployment granger causes economic growth in the long run resulting in the kind of jobless growth experienced in South Africa.

### 3. METHODOLOGY

This study employs annual time series data spanning for the period from 1980 to 2020 obtained from the World Bank. The variables employed are gross domestic product per capita, unemployment rate and inflation rate. The study adopts the Autoregressive Distributed Lag (ARDL) model developed by Pesaran *et al.* (2001) and the Error Correction Model (ECM) that requires data to be tested for integration, cointegration variables, long run relationships, short run relationships and the adjustment speed at which the variable is corrected quarterly. To assure reliance of the study, the study performs residual diagnostics (heteroskedasticity, serial correlation and Jarque-Bera normality test) and stability diagnostics tests (RAMSEY and CUSUM).

**Empirical model estimation:** The adopted ARDL model used in this study was used in the studies conducted by Shahid (2014), Dritsakis and Stamatiou (2016), Makaringe and



Khobai (2018) and Conteh (2021). The econometric model extended from the Cobb-Douglas model can be specified as given below:

$$LGDP_t = \beta_0 + \beta_1 LUNE_t + \beta_2 LINF_t + \varepsilon_t \dots\dots\dots (3.1)$$

Where:

LGDP = Logged gross domestic product per capita

LUNE = Official unemployment rate

LINF = Inflation rate

**Estimation of long run relationship:** Once cointegration has been established among the variables, the ARDL model that can be specified as given below for long run estimations:

$$LGDP_t = \beta_{01} + \sum_{i=1}^p k_{11} LGDP_{t-i} + \sum_{i=0}^q k_{21} LUNE_{t-i} + \sum_{i=0}^q k_{31} LINF_{t-i} + \varepsilon_t \quad (3.2)$$

$$LUNE_t = \beta_{02} + \sum_{i=1}^p k_{12} LUNE_{t-i} + \sum_{i=0}^q k_{22} LGDP_{t-i} + \sum_{i=0}^q k_{32} LINF_{t-i} + \varepsilon_t \quad (3.3)$$

$$LINF_t = \beta_{03} + \sum_{i=1}^p k_{13} LINF_{t-i} + \sum_{i=0}^q k_{23} LUNE_{t-i} + \sum_{i=0}^q k_{33} LGDP_{t-i} + \varepsilon_t \quad (3.4)$$

**Short run relationships:** The short run dynamic error correction model can therefore be derived from an ARDL model through a simple linear transformation. The dynamic short run with long run equilibrium is therefore incorporated by an unrestricted ECM with  $ECT_{t-1}$  that is an error correction term that should be negative and statistically significant.  $\Delta$  represents a differenced variable.

$$\Delta LGDP_t = \beta_{01} + \sum_{i=1}^p \alpha_{1i} \Delta LGDP_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta LUNE_{t-i} + \sum_{i=0}^q \alpha_{3i} \Delta LINF_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \dots\dots\dots (3.5)$$

$$\Delta LUNE_t = \beta_{02} + \sum_{i=1}^p \alpha_{1i} \Delta LUNE_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta LGDP_{t-i} + \sum_{i=0}^q \alpha_{3i} \Delta LINF_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \dots\dots\dots (3.6)$$

$$\Delta LINF_t = \beta_{03} + \sum_{i=1}^p \alpha_{1i} \Delta LINF_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta LUNE_{t-i} + \sum_{i=0}^q \alpha_{3i} \Delta LGDP_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \dots\dots\dots (3.7)$$

**Data analysis:** The ARDL methodology requires the data to be tested for stationarity to determine that variables are stationary at level I (0) and I (1) but no variable should be stationary at second difference. The stationarity of variables helps solve the problem of spurious regression equations. The study utilises the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) stationarity tests and the results are presented in Table 2.

**Table 2: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Test**

Variables	ADF unit root test				PP unit root test			
	Constant		Trend & Intercept		Constant		Trend & Intercept	
	Level	$\Delta$	Level	$\Delta$	Level	$\Delta$	Level	$\Delta$
LGDP	-3.0203 **	-6.6259 ***	-2.9361	-6.5375 ***	-3.0174 **	-6.9549 ***	-2.9316	-6.9403 ***
LUNE	-1.5607	-5.5953 ***	-2.3506	-5.5525 ***	-1.5913	-5.6007 ***	-2.4918	-5.5574 ***
LINF	-1.0978	-12.9099 ***	-6.4689 ***	-12.6241 ***	-3.7210 ***	-14.8167	-6.4516 ***	-14.817 ***

**Source:** Author's own computation (\*), (\*\*), (\*\*\*), significance at 10%, 5% and 1% respectively

The study performs the Augmented Dickey-Fuller and Phillips-Perron unit root test to determine the order of integration of the variables. The results displayed in [Table 2](#) above show that the variables are mainly stationary at first difference  $I(1)$  which is suitable for the employment of autoregressive distributed lag model for the study. This implies that the ARDL model will be employed to analyse the relationship between unemployment and economic growth in South Africa for the period spanning from 1980 to 2020 since it requires the variables to be stationary at level  $I(0)$  or first difference  $I(1)$  or a mixture of the two but no variable should be stationary at second difference  $I(2)$ .

## 4. RESULTS

**Table 3: Leg length criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-301.7571	NA	1856.141	16.03985	16.16913	16.08585
1	-243.1420	104.8902*	136.6257*	13.42853*	13.94566*	13.61252*
2	-235.5428	12.39875	148.6187	13.50225	14.40723	13.82424
3	-230.8244	6.953437	190.9498	13.72760	15.02043	14.18758

**Source:** Author's own computation

The study conducted the ADF, PP and KPSS stationarity tests and discovered that all the variables are stationary at first difference. The study therefore performed a lag length test as shown in [Table 3](#) above and displayed that the optimal lags to include in the study is 1 lag as selected by the LR, FPE, AIC, SC and HQ criterion. The study therefore continues to perform the ARDL bounding test to cointegration as shown in [Table 4](#) below.

**Table 4: ARDL Bound Test**

F-Bounds Test	Null Hypothesis: No levels relationship			
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	8.400473	10%	3.17	4.14
k	2	5%	3.79	4.85
		2.5%	4.41	5.52
		1%	5.15	6.36

**Source:** Author's own computation

The study performed an ARDL bounding test and the results are displayed in [Table 4](#) above. From the results in [Table 4](#), the f-statistic is (8.400473) is greater than the  $I(0)$  and  $I(1)$  critical bounds at 1%, 2.5%, 5% and 10% level of significance confirming existence of a long run relationship among the variables in the model. The study

therefore continues to employ the unrestricted autoregressive distributed lag model to determine the long run relationship as displayed in [Table 5](#) below.

**Table 5: ARDL and Long Run Relationship**

Levels Equation				
Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob
LUNE (-1)	-0.096950	0.111101	-0.872632	0.3888
LINF (-1)	-0.415653	0.153811	-2.702358	0.0105

**Source:** Author's own computation (\*), (\*\*), (\*\*\*), significance at 10%, 5% and 1% respectively

After determining the existence of a long run relationship, the study continued to test long run relationship by employing an ARDL model as displayed in [Table 5](#). The results confirm that there is a negative statistically insignificant relationship between unemployment and economic growth in South Africa. This implies that a 1% increase in unemployment will insignificantly result in economic growth declining by 0.10%, ceteris paribus. These results indicate that unemployment in South Africa does not significantly affect economic growth. These results are consistent with the studies carried by [Makaringe and Khobai \(2018\)](#). These results are similar to the short run results given in [Table 6](#) below, that is, even though they are insignificant, the negative effect they have on economic growth calls for more focus to policies that reduce unemployment rate and increase economic growth.

Furthermore, there exists a negative statistically significant relationship between inflation and economic growth in South Africa in the long run. This implies that a 1% increase in inflation in the long run in South Africa will significantly result in economic growth declining by 0.42%, ceteris paribus. These results make economic sense as it is known in economic theory that there is a negative relationship between inflation and economic growth. South Africa also follows an inflation targeting policy to keep track and control inflation to reduce its detrimental effect on the growth of the economy. These results mean that inflation is the only variable that significantly explains economic growth in the model used in the present study. Though models differ, the effect of inflation on economic growth does not vary that significantly. Policies that reduce inflation should therefore be of interest in order to make sure that the detrimental effect of inflation can be captured to increase economic growth in South Africa.

### Cointegrating Equation

$$D(LGDP(-1)) = 4.124409127286 - 0.669700032303*(LGDP(-2) - (-0.09695030*LUNE(-1) - 0.41565252*LINF(-1)))$$

The ECM results in Table 6 above indicates short run estimations. The results review a negative statistically insignificant relationship between unemployment and economic growth in South Africa in the short run. This implies that a 1% increase in unemployment in the short run in South Africa will insignificantly reduce unemployment y 0.06%, ceteris paribus. This means that unemployment in South Africa in the short run does not significantly affect economic growth. These results are consistent with the studies carried by Makaringe and Khobai (2018). Even though the results are insignificant, the negative impact of unemployment on the growth of the economy calls for more focus to be placed so that the detrimental effect is understood and addressed in the short run.

**Table 6: ECM and Short Run Relationship**

<b>Error Correction Model Regression</b>				
<b>Case 3: Unrestricted Constant and No Trend</b>				
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob</b>
D(LGDP(-2))	0.330300	0.139334	2.370557	0.0234
D(LUNE(-1))	-0.064928	0.073112	-0.888055	0.3806
D(LINF(-1))	-0.278363	0.102572	-2.713834	0.0103
CointEq(-1)*	-0.669700	0.129748	-5.161540	0.0000
C	4.124409	0.878522	4.694713	0.0000
R-squared	0.418618			
Adjusted R-squared	0.402905			
Durbin-Watson stat	1.760190			

**Source:** Author's own computation (\*), (\*\*), (\*\*\*), significance at 10%, 5% and 1% respectively

Furthermore, there is a short run negative statistically significant relationship between inflation and economic growth in South Africa. This implies that a 1% increase in inflation in the short run will significantly reduce economic growth by 0.28%, ceteris paribus. These results make economic sense since it is known in existing economic theory that an increase in inflation is detrimental for the growth of an economy. Special focus must be placed to devise policies that mitigate the negative effect, and in doing so, reduce inflation so the country's economy can grow.

The coefficient of the error correction term is negative and statistically significant, indicating that if there is an error in economic growth, then 67% of the errors are corrected annually. This is a fairly good rate the speed of adjustment as 67% of the errors in gross domestic product is corrected towards long run equilibrium. The R-squared (0.418618) is less than Durbin-Watson (1.760190) statistic indicating that the model is not a spurious regression. The adjusted R-squared is 0.402905 which mean that 40.29% of the variation in the model is explained by the independent variables.

The study utilised the Granger causality test with 1 lag included and the results are displayed in [Table 7](#) above. The results validate that there is no causality between unemployment and economic growth in South Africa. This, however, does not make economic sense as it is well-established in theory that unemployment has a causal effect on growth of the economy. Unemployment is found to granger cause inflation for the period understudy. This means that the policies that affect unemployment in South Africa have a causal effect on inflation.

**Table 7: Granger Causality Test**

<b>Null Hypothesis</b>	<b>F-Statistic</b>	<b>Prob.</b>
LUNE does not Granger Cause LGDP	0.12035	0.7306
LGDP does not Granger Cause LUNE	1.16456	0.2875
LINF does not Granger Cause LGDP	0.00226	0.9623
LGDP does not Granger Cause LINF	0.92718	0.3418
LINF does not Granger Cause LUNE	1.01873	0.3194
LUNE does not Granger Cause LINF	3.59818	0.0657

**Source:** Author's own computation

**Table 8: Residual Diagnostic Test**

<b>Test</b>	<b>Probability value</b>	<b>Decision</b>
Breusch-Pagan-Godfrey	0.5757	Fail to reject Ho
Harvey	0.4279	Fail to reject Ho
Glesjer	0.4825	Fail to reject Ho
ARCH	0.9938	Fail to reject Ho
Jarque-Bera	0.7032	Fail to reject Ho
Breusch-Godfrey Serial correlation test	0.2334	Fail to reject Ho

**Source:** Author's own computation

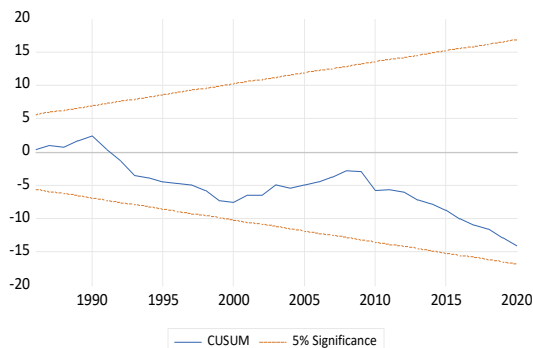
The study performed the residual diagnostic test to check for heteroskedasticity and serial correlation among the residuals. The results of all the heteroskedasticity tests have a probability value that is greater than 5%, indicating the failure to reject the null hypothesis (Ho) that the residuals are homoscedastic. The Jarque-Bera normality test have a probability value (0.7032) that is greater than 5%, indicating the failure to reject the null hypothesis (Ho) that the residuals are normally distributed. The results of the Breusch-Godfrey-Serial correlation test have a probability value (0.2334) that is above 5%, implying the failure to reject the null hypothesis (Ho) with the conclusion that there is no serial correlation in the model for up to 1 lag that we utilised estimating the relationship between unemployment and economic growth in South Africa.

The study performed stability diagnostic test and the results of the CUSUM and CUSUM of squares are displayed in [Figures 1](#) and [2](#) above. The CUSUM chart relies on the specification of a target value and a known or reliable estimate of the standard deviation.



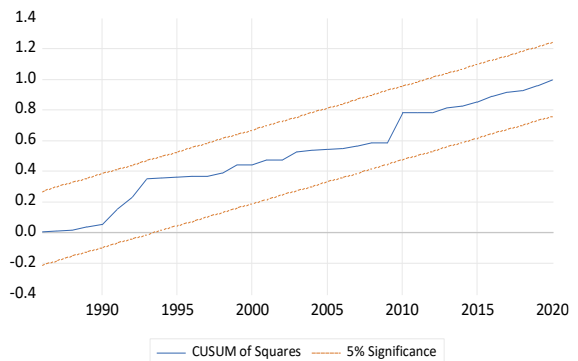
For this reason, the CUSUM chart is better used after process control has been established. The CUSUM chart typically signals an out-of-control process by an upward or downward drift of the cumulative sum until it crosses the boundary. An assignable cause is suspected whenever the CUSUM chart indicates an out-of-control process. The blue line in the CUSUM and CUSUM sum of squares drifts within 5% critical bounds (red lines) indicating that the model is stable for the period understudy. This means that the results found in this study are reliable for policy formulation.

**Figure 1: CUSUM**



**Source:** Author's own computation

**Figure 2: CUSUM of Squares**



**Source:** Author's own computation

**Table 9: Ramsey Reset Test**

	Value	df	Prob
t-statistic	0.138169	34	0.8909
F-statistic	0.019091	(1, 34)	0.8909
Likelihood ratio	0.021892	1	0.8824

**Source:** Author's own computation

The study utilised a Ramsey Reset test and the results are displayed in [Table 9](#) above. The probability of the f-statistic (0.8909) is greater than 5%, implying the failure to reject the null hypothesis that the model does not suffer from misspecification. This implies that the model is stable and reliable for policy formulation. These results also confirm that there is a linear relationship between the variables in the model as we fail to reject the null hypothesis of the Ramsey RESET test.

## 5. CONCLUSION AND RECOMMENDATION

The primary objective of the study was to analyse the relationship between unemployment and economic growth in South Africa for the period spanning from 1980 to 2020 utilising annual time series data from the World Bank. This research objective was fulfilled by employing unit root tests of ADF and PP to avoid spurious regressions. The study utilised the optimal lag length criteria to determine the optimal lag suitable

for the model and the ARDL bound test to determine the order of integration of the variable to ascertain the applicability of the autoregressive distributed lag model in the nexus. The study employed the ARDL model and the error correction model to analyse the long run and short run relationships respectively. The significance of the results was revealed by utilising the residual and stability diagnostic tests. The error correction model revealed the speed of adjustment in economic growth to be 67% annually.

Unemployment was found to have a negative statistically insignificant relationship with economic growth both in the short and long run period respectively. These results were validated by the granger causality tests that revealed a noncausal effect between unemployment and economic growth employing 1 lag in the model. Inflation was found to have a negative statistically significant relationship with economic growth both in the short and long run period respectively. The policy implications of these results are as follows:

Firstly, the negative statistically insignificant relationship between unemployment and economic growth might be a result of capital-intensive technology or methods of production where machineries replace human labour in the way of minimizing costs. These negative results call for firms and the government to adopt policies that promote labour-intensive methods of production in the mining sector agricultural sector since they employ more labour-intensive methods to reduce skyrocketing unemployment rate in South Africa in order to increase economic growth.

Secondly, it can be suggested that the negative impact of unemployment on economic growth calls for the government to introduce subsidies to upgrade the skillset of those who are skilled in companies and those who are unskilled to skill them through education in order to reduce unemployment in South Africa. This calls for the government to start to invest in human capital to reduce the number of people that are unemployed both at provincial and national level with a view to mitigate the negative impact of unemployment on economic growth.

Thirdly, the government must increase its investment in education and skill development to equip the people with the skills currently on high demand in the labour market. This will help to absorb the large pool of unskilled workers by equipping them with the necessary education and skill needed for them to be employable in the labour markets, thereby reducing the detrimental impact of unemployment on the growth of South African economy as people become more employable.

Fourthly, the negative relationship between inflation and economic growth substantiated with causal effect running from unemployment to inflation calls for the policymakers to keep an eye on inflation as it significantly reduces economic growth. The policymakers must introduce both contractionary fiscal and monetary policies to maintain a lower inflation rate by formulating policies that are conducive to job creation to reduce unemployment and increase economic growth.

In conclusion, it has been shown that unemployment has been increasing from 2017 to 2020 which led to slowed down economic growth in South Africa. In 2019 and 2020, unemployment worsened because of the global pandemic of Coronavirus. The study acknowledges that the signs of the variables might not be consistent with the theory, therefore, great care needs to be taken when interpreting these results and policy decisions.

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