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# AN ASSESSMENT OF THE IMPACT OF MACROECONOMIC INDICATORS ON UNEMPLOYMENT RATE IN AFRICA: A CASE STUDY OF SOUTHERN AFRICAN ECONOMIES

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**Abstract:** *In recent years, unemployment has been a source of concern for African countries. Hence the objective of this investigation was to examine the influence of selected macroeconomic indicators on unemployment in South Africa, Botswana, Namibia, Lesotho, and Eswatini using annual panel data from 1990 to 2022. To ascertain the effects of the selected macroeconomic indicators, the investigation used the pool mean group (PMG) under the autoregressive distributed lag (ARDL) method. The variables in this investigation are unemployment rate, economic growth represented by gross domestic product (GDP), inflation, government expenditure, gross fixed capital formation and interest rate. The results reveal that government expenditure, interest rate and GDP have an inverse and significant impact on unemployment rate in the long run. In addition, gross fixed capital formation and inflation have a positive impact on unemployment rate in the long run but only the impact of inflation is significant. The analysis yielded the following policy suggestions: One of the remedies lies in the administration of South Africa, Botswana, Namibia, Lesotho, and Eswatini. By concentrating more on developing appropriate policies that alleviate the burden of high production costs for producers, such as absorbing a portion of these costs, governments can help prevent workforce reductions and maintain current employment levels, thus mitigating high unemployment rates. In addition, policymakers should develop policies or strategies to monitor the movement of gross domestic product and promote sustainable gross domestic product.*

**JEL classification:** E24,

**Key words:** Unemployment, PMG ARDL method, Macroeconomics

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## 1. INTRODUCTION

Unemployment is a major global issue in almost every economy, both developed and emerging. According to Sahoo and Sahoo (2019), unemployment is a multifaceted phenomenon because it affects both a country's economic activity and society's social structure. As a result, these two dimensions increase complexity and necessitate extensive analysis to address unemployment. Unemployment refers to the state of individuals who are actively looking for work but are now unable to find it (Eita & Ashipala, 2010).

One of the fundamental goals of economic policies is to reduce the unemployment rate by stimulating economic growth. Abugamea (2018) contends that there are various aspects that influence unemployment, such as the primary aspect being economic growth, which commonly assumes that Okun's law controls how unemployment and economic growth interact. Hypothetically, an expansion in the economic growth of a country boosts the employment rate, thus lowering the unemployment rate. African economies have experienced increased growth, without a subsequent decline in unemployment. Therefore, the connection between unemployment and economics becomes uncertain, particularly in the Southern African region, which is characterized excessive unemployment rates.

Inflation is another factor that influences unemployment rates. Indeed, inflation plays an important role in macroeconomic instability, as highlighted (Thao & Hua, 2018). A high inflation rate can shrink social welfare, while low inflation can hamper economic growth and job creation, ultimately leading to recession and an increase in poverty, as noted by (Wulandari *et al.*, 2019).

Government spending is another factor that influences unemployment rates. According to Onuoha and Agbede (2019), government spending has filled a strategic position in many economies and is a significant tool in fiscal policy. Furthermore, government spending is essential for the well-being of citizens and for fostering economic growth. Notably, in developing economies, government spending plays an active role in creating jobs and reducing unemployment. Nwosa (2014) asserts that the responsibility of the government consists of financial bailouts of the whole economy, which is to increase government spending. Despite the expansion of government spending to stimulate the economy by deepening investment in agriculture to create jobs and reduce poverty, challenges remain in African economies (Nwosa, 2014). Even with output growth, increased government spending

instruments, and endowed resources, the development levels in most African economies are still low (Akinyele *et al.*, 2023).

Despite the policies that have been implemented by Southern African economies to increase employment, unemployment continues to increase. For instance, South African government announced Growth, Employment, and Redistribution (GEAR) framework in 1994 to restructure the economy. This framework was intended to stimulate economic growth and reduce unemployment (Kearney & Odusola, 2011). In 2010, new framework called a new growth path was developed in South Africa with the intention of tackling unemployment inequality, and poverty through investing resources in an infrastructure program (The Presidency of South Africa, 2010). The African Development Bank (2022) highlighted that the South African economy experienced a reduction of 6.4% in 2020 due to the Covid-19 pandemic but the economy increased by an estimated 4.9% in 2021, stimulated by a recovery in finance on the supply side and fixed investment on the demand side. Nonetheless, growth was accompanied by a high rate of unemployment (35%), which is one of the highest unemployment rates in Southern Africa.

In Namibia, during President Sam Nujoma's tenure (1990-2005) the president objectives were to alleviate poverty and inequality, stimulate economic growth and employment. However, unemployment has remained obstinately high owing to limited and suitable complementary actions and the economy's unchanging structure (Mwinga *et al.*, 2019). Similarly, during president Hage Geingob's tenure (2015-2019) efforts were taken to reduce employment rate such as the Harambee Prosperity Plan (HPP) but unemployment remains a concern. Statistically, from 1991 to 2021, Namibia's unemployment rate averaged 21%, peaking at 24.5% in 1997 and hitting a low of 16.8% in 2012. However, in risen back 21% percent in 2022 (World Bank, 2023).

The policies and programs designed to tackle unemployment in Botswana have not produced the expected results, despite continuous political support evidenced by large government investment in youth development initiatives, multiple program launches, and substantial youth enrolment (Nthomang & Diraditsile, 2016). The government has been accused of prioritizing short-term underemployment, insufficient jobs, and unsustainable programs that have little impact on job growth. Unfortunately, the unemployment rate in Botswana increased from

17.5 percent of the labor force in 2015 to 22.2 percent in 2019 and then to 26.0 percent in 2021 (Republic of Botswana, 2023).

In Eswatini, the issue of unemployment persists despite efforts to combat it. The remarkable problem to date is creating enough job opportunities to either entirely eliminate or substantially reduce the rate of unemployment (Khumalo & Eita, 2015). It has been indicated that Eswatini's economic growth is stagnant, failing to create the required job opportunities and driving up the country's unemployment rate. Eswatini remains heavily affected by the co-occurring TB-HIV epidemic, affecting the government intentions to stabilize the economy.

Therefore, it is against the above backgrounds that this study assesses the impact of macroeconomic indicators on unemployment in Botswana, Lesotho, Eswatini, Namibia and South Africa. One specific aspect of these economies is that they have similarities in social norms, languages, culture, background, and historical past. In addition, these economies have formed a custom union, known as the Southern African Customs Union (SACU), and other members of this custom union have formed a Common Monetary Area. Therefore, these countries were highly affected by each other.

Addition, the labor market in Southern African economies has a high unemployment rate. Unemployment is an important issue that affects society, both politically and economically. Unemployment may lead to loss of human capital, social exclusion, disturbances, high crime rates, and morbidity. In addition, unemployment adds to prevalent poverty and raises income inequality, enlarging the gap between haves and have-nots in society. Consequently, this necessitates a comprehensive understanding of the impact of macroeconomic indicators on unemployment rates in respective economies.

The current body of empirical research on unemployment in Southern Africa is considered insufficient or deficient due to the inconsistent findings observed in prior studies. In addition, the question of the impact of macroeconomic indicators on unemployment in Southern African economies remains unresolved, since even empirical research that corresponds to the same list cannot settle on how each component influences unemployment. For instance, Banda *et al.* (2016) and Sinha and Tseladikae (2018) noted that economic growth positively affects unemployment in South Africa and Botswana, while Khalid *et al.* (2021) showed no evidence of a long-run association between economic growth and unemployment in South Africa. Conversely, Khumalo and Eita (2015) discovered that economic growth negatively

influences unemployment in Eswatini. Moreover, Khumalo and Eita (2015) confirm that inflation has a negative relationship with unemployment. Such contrasting perspectives or mixed conclusions on the determinates of unemployment prompted the current study to lend a voice on the impact of macroeconomic indicators. In addition, this present study offers a region-wide approach unlike the majority of studies conducted in the Southern African region that have provided a county specific analysis.

The main objective of this study is to discover the nature and extent of the effect of macroeconomic indicators on unemployment rates in South Africa, Botswana, Namibia, Lesotho, and Eswatini collectively. In addition, this study aims to uncover the macroeconomic factors that contribute to unemployment rates in the aforementioned economies. Lastly, this study aims to provide policy suggestions that can be used to control the unemployment rate in the Southern African region.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature. Section 3 discusses data sources, definitions, and methodologies. Section 4 presents and discusses the results. Section 5 presents conclusions and recommendations.

## 2. LITERATURE REVIEW

This section reviews the literature on employment, with an emphasis on the economic theory underlying unemployment and its determinants. Furthermore, this section examines empirical literature containing findings from investigations relevant to the study's aims.

### 2.1 Theoretical Literature

This section examines economic theories that underpin the connection between unemployment and macroeconomic indicators. The revised theories include Okun's law, Philips curve concept, and Keynesian model.

**Okun's law**

Okun's law, which enlightened the observed sustained debate presented by Arthur Okun, arose from the economic events of the post-war period. Okun presented an economic theory based on economic growth and unemployment (Vladi & Hysa, 2019). The rule of thumb is used in the law to explain and analyze the relationship between employment and growth. According to Okun's law, gross domestic product (GDP) and the unemployment rate have a proportionally inverse relationship. In addition, this law suggests that when the GDP increases, the unemployment rate declines. This theory supports the economic hypothesis that

a 1% decrease in the unemployment rate is an effect of a 3% increase in GDP (Okun, 1962). This implies that there is a direct relationship between production and the workforce. Linking this to the Southern African economies suggests that over the years, the Southern African economies were productive in the existing workforce rather than creating new employment opportunities. On the other hand, Okun postulated that an unemployment rate that exceeds the natural rate of unemployment is directly tied to a percentage of the GDP gap (Mukisa *et al.*, 2020). Therefore, to reduce unemployment, the degree of GDP growth must be greater than that of potential output growth. The following equations mathematically represent Okun's law:

$$\Delta u = k\ (y - y*) \quad (1)$$

where y denotes the growth rate of the good, Δu represents the change in the unemployment rate, and y* is the growth trend of the real GDP. This proportion differs by economy; in years when the economy grows faster than the natural rate, the unemployment rate rises by k multiplied by the difference between the natural and actual growth rates.

**Phillips Curve Concept**

The Phillips curve is a type of economic model named after William Phillips'. A New Zealand economist named Philips wrote an influential article in 1958 representing an inverse link between the unemployment rate and the rate of change in wages (trade-off between inflation and unemployment) in the United Kingdom from 1861 to 1913 (Dorn, 2020). Phillips (1958) discovered that an inverse link continued when the dataset was expanded to 1957. According to the Phillips curve, economic prosperity leads to inflation, which generates more job opportunities and reduces unemployment. According to the Phillips curve hypothesis, inflation variations within an economy are predictable in response to changes in unemployment (Vladi & Hysa, 2019).

According to the trade-off principle, in the 1960s, it was held that any government stimulus would increase aggregate demand and initiate subsequent possible effects. In addition, a decline in the unemployment rate can be achieved by stimulating aggregate demand and allowing the inflation rate to rise (Mohr, 2020). Job demand rises, unemployment falls, and wages increase to attract a smaller talent pool. Following these effects, wages would rise, as do prices. Furthermore, the country has experienced either inflation or unemployment, but never both simultaneously (Vladi & Hysa, 2019).

**Keynesian theory**

British economist John Maynard Keynes founded Keynesian theory in his 1936 book "The General Theory of Employment, Interest, and Money," which was released during the Great Depression. The theory was based on the disapproval of the classical theory. Keynes (1936) claims that aggregate demand achieves economic equilibrium. Aggregate demand refers to the sum of products produced by the economy and their sum exchanged by consumers at various prices. Keynes argued that additional services and goods are directly related to an increase in demand in the system. During the 1929 global failure and extraordinarily high inflation, classical economists proposed that the economy be trusted to fix its own problems, because it is a closed cycle (Vladi & Hysa, 2019). Keynes believed that such periods of crisis required decisive action, or irreparable harm would occur in the long run of economic self-recovery.

According to classical assumptions, unemployment is a result of aggregate demand; nevertheless, the consequences of higher-than-market-equilibrium real wages must be considered. As a result, classical philosophers recommend that wages ought to be reduced. Keynesian suggests that wages are sticky downwards; this simply means that employees would not be pleased with accepting wage reductions and would reject them. This suggests that wages would not certainly drop enough to clear the market, and therefore, employment would remain. Keynes (1936) believed in the closed circle of capital; however, argued that governmental intervention was beneficial during crises. If the government intervenes in expenditures on goods or services, prices would drop and thus become accessible for consumer demand. However, businesses gain profit and employ more workers. Moreover, wages and consumer spending would increase as businesses hired more workers. At this point, there is a closed circle of growing aggregate demand, which is fundamental to economic prosperity.

**2.2 Empirical literature review**

Using the Engle-Granger two-step econometric technique, Khumalo and Eita (2015) examined the macroeconomic determinants of unemployment in Eswatini using annual time series data from 1991 to 2012. The model consisted of the following variables: unemployment: GDP, government expenditure, inflation, a dummy variable for democratization of South Africa in 1994, and the international economic crisis of 2007-2009. The findings verified the long-term link between unemployment and the explanatory

variables. Furthermore, all explanatory variables were found to be determinants of unemployment in Eswatini. These findings imply that unemployment in Eswatini could be lowered by boosting GDP at the expense of high inflation. This can also be reduced by allocating a larger share of government spending to activities that boost GDP and investment. Nonetheless, the study has failed to capture all the macroeconomic factors that may affect unemployment such as investment. Hence, the present study adds investment in addition to macroeconomic factor capture by Khumalo and Eita (2015).

Using a vector error correction model (VECM), Banda et al. (2016) explored the impact of economic growth on unemployment in South Africa using quarterly time-series data between 1994 and 2012. The model consists of the following variables: GDP, exchange rate, budget deficit, labor productivity, and unemployment. The findings demonstrate that budget deficit, GDP, and exchange rate have a positive long-term influence on unemployment, whereas labor productivity negatively affects unemployment. The authors recommended that the government should redirect its expenditure towards programs that directly and indirectly encourage the formation of employment and decent jobs, create a favorable atmosphere and flexible labor market regulation that does not obstruct job development, and favor industries that require a high level of labor. However, this research has encountered methodological limitations because it relied on time series data specifically from South Africa, potentially limiting the generalizability of its findings to other countries. Therefore, the present study utilizes panel data to capture a broader regional representation.

Folawewo and Adeboje (2017) examine the macroeconomic factors of unemployment in the Economic Community of West African States (ECOWAS). Random and fixed effects, together with fully modified ordinary least squares (FMOL), were used to estimate the panel data. This study used annual data from 1991 to 2014. The findings show that GDP has a negative, but insignificant, influence on unemployment. Inflation has a considerably positive influence on unemployment, demonstrating that the Phillips curve hypothesis is flawed. The findings also revealed that labor productivity had a positive impact on the unemployment rate, indicating a trade-off between employment and labor productivity. Furthermore, external debt and FDI have a minor negative influence on unemployment, although a population increase has a growing impact. The benefit of this study is that it provides broader insights because it focuses on a region rather than on individual countries.

Sinha and Tseladikae (2018) assessed the connection between economic growth and unemployment in Botswana, using yearly data from 1991 to 2012. The study applied ordinary least squares (OLS) and VECM. The findings obtained from OLS results show an insignificant and positive connection between economic growth and unemployment. Similarly, the findings from the VECM failed to identify any short- or long-run links. However, the gap version OLS revealed a negative but insignificant connection, whereas in the long run, the VECM data revealed a positive and significant connection. Nonetheless, these findings invalidate Okun's theory of the presence of a negative correlation between unemployment and economic growth. The study recommends that the government increase its efforts to diversify the labor-intensive industries of the economy, such as agriculture and tourism. Most of the work carried out with OLS method have been acknowledged for yielding optimal estimates of unobserved parameters but the method is susceptible to outliers in the data used for model construction. Additionally, its extrapolation capabilities are weakened by assumptions spanning extensive ranges, and the OLS method becomes unstable when confronted with a large number of variables.

Some methods offer advantages over OLS, prompting this present study to propose the use of autoregressive distribution lag (ARDL) method, which provides greater benefits. For instance, ARDL is capable of generating robust and well-organized estimates in small and large sample size and limits the number of cointegrating vectors to one. Additionally, ARDL is designed for cointegration analysis, while OLS is not made for such analysis.

In the context of India, Sahoo and Sahoo (2019) investigated the relationship between unemployment and some macroeconomic factors for the period between 1991 and 2017. In the study analysis VECM was employed. The findings indicated that the unemployment rate in India is influenced by GDP, inflation, literacy rate, gross fixed capital information and labor force. In addition, the study established the long run relationship between the variables employed in the study. Sahoo and Sahoo (2019) recommended that the state should produce more jobs to address unemployment, focusing on modernizing the agricultural sector and introducing updated equipment to attract people of various qualifications and professions.

In the territory of Western Balkan countries, Vladi and Hysa (2019) examined the of impact of some macroeconomic factors on unemployment rate for the period between 2000 and 2017. The analysis of the study was undertaken by employing Vector Autoregressive model (VAR)

and panel data. The findings indicate that macroeconomic factors namely, interest rates, foreign direct investment, inflation and GDP are significant in influencing unemployment rate in Western Balkan countries.

Using Vector Autoregressive model (VAR), Khalid et al. (2021) investigated the effects of inflation, economic growth, and exchange rate on unemployment in South Africa using annual time data from 1980 to 2018. The results of the Johansen method for cointegration confirmed that there was no indication of a long-run correlation between the variables. The results of Granger causality state that there is bidirectional causality between the pairs of real unemployment rate vs. GDP, unemployment rate vs. inflation rate, and unemployment rate vs. exchange rate; conversely, unidirectional causality was observed in the pairs of real exchange rate vs. GDP and exchange rate vs. inflation. The results of impulse responses confirmed that the exchange rate had a significant negative reaction to the unemployment rate in the long run; on the other hand, in the long run, the reaction of real GDP to the unemployment rate was positive and significant. In addition, the results of the variance decompositions show that all explanatory variables greatly forecast the unemployment rate in the short and long run.

The evaluated papers have made significant contributions to the analysis and understanding of unemployment phenomena as well as the development of various policy strategies to combat unemployment worldwide. However, the existing empirical literature on unemployment in South African economies is limited, as can be seen by mixed findings. In addition, the question of the impact of macroeconomic indicators on unemployment in Southern African economies remains unresolved, since even empirical research that corresponds to the same list cannot settle on how each component influences unemployment. The majority of the existing empirical research on unemployment factors in Southern Africa consists of individual country studies (Banda et al., 2016; Khalid et al., 2021; Khumalo et al., 2015; Sinha and Tseladikae, 2018). Little empirical research has been conducted on the factors of unemployment as a group in African economies, such as Folawewo and Adeboje (2017), whose study focused on ECOWAS. However, the most of reviewed studies suffered from notable methodological weakness. For instance, the application of time series data, which has been mostly criticized in the literature due to its limited external validity. Time series data are designed for country specific, implying that conclusions drawn from one dataset may not apply to different. Therefore, this present study offers a region-wide approach unlike the majority of reviewed

studies in the Southern African region that have provided a county specific analysis. An effort to examine macroeconomic variables on unemployment in the region have been distant. For instance, Folawewo and Adeboje (2017), whose study focused on ECOWAS, and Vladi and Hysa (2019), whose study focused on Western Balkan countries. Given an attempt to fight against unemployment rate in the selected Southern African economies, the present sought to examine the impact of macroeconomic indicators on unemployment in the selected Southern African economies by panel autoregressive distribution lag method.

## 3. RESEARCH METHODOLOGY

The model specification, data source, methodology, and modelling procedures used in this study are covered in this section. The analysis in this study was guided by a theoretical framework. The purpose of this section is to describe the tools and methodologies used to achieve this study's objectives.

### 3.1 Model specification

This study adopts and modulates the model of Vladi and Hysa (2019), who examined the impact of macroeconomic indicators on unemployment in Western Balkan nations using a panel model. The model is as follows:

$$\log(unemployment_{rate}) = F(interest_{rate}, inflation, gdp, fdI) \quad (2)$$

Based on the theoretical framework that underpins this study, equation (2) is modified by removing foreign direct investment and adding new significant variables to this research, that are, government expenditure and gross fixed capital formation. The justification for adding government expenditure is grounded in a theoretical context. According to the Keynesian theory, government expenditure is a significant macroeconomic factor that determines unemployment. Therefore, the modified econometric model is specified as

$$UNR_{i,t} = \alpha_i + \delta_i GE_{i,t} + \theta_i INF_{i,t} + \vartheta_i GDP_{i,t} + \gamma_i IR_{i,t} + \varphi_i GFC_{i,t} + \epsilon_{i,t} \quad (3)$$

Where UNR is unemployment rate, GE is government expenditure, INF is inflation (INF), GDP is gross domestic production, IR is interest rate, and GFC is gross fixed capital information. Whereas $\delta_i$, $\theta_i$, $\vartheta_i$, $\gamma_i$, and $\varphi_i$ represent the parameter of economy $I$ and $\epsilon_{i,t}$ is the error term.

Unemployment (UNR) - Is defined as people who are not working but are available to work and look for work (Eita & Ashipala, 2010).

Government expenditure (GE) - describes the acquisition of goods and services, including public investment and consumption, as well as transfer payments, including income and capital transfers. This study hypothesizes that government spending and unemployment may have a negative relationship, which is in line with the Keynesian philosophy.

Inflation (INF) - Is described as a continual increase in the overall price level of goods and services in a country at a certain time and is frequently calculated using the consumer price index (Mohr, 2020). Based on the Philips curve, this study hypothesizes that there may be a negative connection between unemployment and inflation.

Gross domestic product (GDP) - It depicts the aggregate value of the final national output produced within the country (Mohr, 2020). This study hypothesizes that there may be a negative connection between GDP and unemployment, in accordance with Okun's law.

Interest rate (IR) - The amount charged as a portion of any loaned or deposited money is known as interest rate. Higher interest rates often result in lower consumer spending and company investment, which reduces hiring and increases unemployment. Hence, this study hypothesizes that that there may be a positive connection between unemployment and interest rates.

Gross fixed capital formation (GFC) – Gross fixed capital formation is also called investment. It quantifies the worth of acquiring new or already established fixed assets by various entities such as businesses, governments, and individual households, excluding any assets disposed of by them, including those of their unincorporated businesses (Ikechi & Emmanuel, 2015). In principle, higher investment results in the creation of jobs or the expansion of employment opportunities. Therefore, this hypothesizes that there may be a negative relationship between gross fixed capital formation and unemployment.

**3.2 Data source**

To estimate a regression model, this study employed annual panel data from 1990 to 2021 with a sample of 31 observations. Secondary data for the study variables, except for inflation, were traced from the World Bank (World Development Indicators), and data for inflation were traced from Statista. The study period is selected based on the unemployment trends in the countries under consideration, economic events that occurred during the chosen period, such as changes in government, financial crisis and the COVID-19 pandemic, and lastly, the

availability of data. Empirical estimations were made using the econometric tool Eviews 12. The researcher has obtained Eviews license.

**3.3 Modelling procedure and statistical method**

This study evaluates the influence of macroeconomic indicators on unemployment using the pool mean group method under an autoregressive distributed lag (ARDL) approach. Pesaran and Shin (1999) developed the ARDL approach, which achieves a single cointegration equation and was updated by Pesaran *et al.* (2001). The method was used because it can dynamically find short- and long-run coefficients while taking errors into consideration. Compared with other symmetric techniques, this method has a number of benefits: it is appropriate and valid for assessing variables integrated at *I*(0), *I*(1), or a combination of the two. Furthermore, ARDL is advantageous if the sample observation is small or large, in contrast to the Johansen and Juselius test, Engle and Granger test, and Johansen test, which all insist on the integration of variables at *I(1)*. Even with a small sample size, the ARDL model yields reliable results. Chudik *et al.* (2015) denote the PARDL approach as follows:

$$y_{it} = \sum_{\ell=1}^{p_{yi}} \varphi_{i\ell} y_{i,t-\ell} + \sum_{\ell=0}^{p_{xi}} \beta_{i\ell} x_{i,t-\ell} + \mu_{it} \quad (4)$$

$$\mu_{it} = \gamma_i' f_t + e_{it} \quad (5)$$

where $y_{it}$ characterizes the predicted variable, $x_{it}$ denotes a vector of (k*1) explanatory variables, $it$ represents the sum of the cross-sectional unit ($i$= 1….,5) whereas ($t$= 1990,1991….,2021), $f_t$ denotes the unit-specified constant effects, $p_{yi}$ and $p_{xi}$ are ideal lag orders, and $e_{it}$ denotes the error term. Both long- and short-run models are specified using the PARDL method as follows:

The long run model:

$$UNR_{it} = \sum_{\ell=1}^{p_{yi}} \varphi_{i\ell} UNR_{i,t-\ell} + \sum_{\ell=0}^{p_{xi}} \delta_{i\ell} GE_{i,t-\ell} + \sum_{\ell=0}^{p_{xi}} \theta_i INF_{i,t-\ell} + \sum_{\ell=0}^{p_{xi}} \vartheta_{i\ell} GDP_{i,t-\ell} + \sum_{\ell=0}^{p_{xi}} \gamma_{i\ell} IR_{i,t-\ell} + \sum_{\ell=0}^{pxi} \varphi_i GFC_{i,t} + \gamma_i' f_t + e_{it} \quad (6)$$

The short run model:

$$\Delta UNR_{it} = \beta_i UNR_{i,t-1} + \varphi_i UNR_{i,t-1} \sum_{j=1}^{p-1} \omega_{it} \Delta UNR_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta GE_{i,t-j} + \sum_{j=0}^{q-1} \theta_{ij} \Delta INF_{i,t-j} + \sum_{j=0}^{q-1} \vartheta_{ij} \Delta GDP_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij} \Delta IR_{i,t-j} + \sum_{\ell=0}^{xi} \varphi_i \Delta GFC_{i,t} + \gamma_i' f_t + e_{it} \quad (7)$$

The initial stage, like any other econometric technique, involves descriptive statistics. An illustration of the descriptive statistics of the series (average, minimum, and maximum values,

median, kurtosis, skewness, and standard deviation) was calculated before testing for stationarity. Following the descriptive statistics, is the correlation examination, which determines the power and order of interrelation among variables.

The third stage determines the order of integration. To achieve this criterion, this study uses Im, Peresan, and Shin (IPS) and Levin, Lin, and Chu (LLC) unit root tests were conducted. The homogeneity of the autoregressive coefficient, which signifies whether a unit root exists, is exploited using the LLC unit root test. On the other hand, the IPS test accounts for variability in the time-series trend and intercept across sample units (Levin *et al.*, 2002).

The fourth stage involves choosing the best lag using three key information criteria and the VAR approach. These criteria, identified as Schwarz information criterion (SIC), Akaike information criterion (AIC), and Hannah Quinn information criterion (HQIC), are employed to determine the best lag(s) for the regression and the explanatory variables. Notably, to the greatest possible extent, all information criteria should be small (Brooks, 2014).

The cointegration of the variables is in the fifth stage. A cointegration test is crucial, because it determines whether a model empirically displays a long-term relationship. Although there are numerous cointegration tests, the primary focus of this study is panel data; therefore, panel cointegration tests were used. The Kao test is a panel cointegration test. The cointegrating vectors are thought to be the same as those in the Kao test (Kao, 1999).

The sixth stage consisted of a pooled mean group model estimation. The pool mean group model was taken using the autoregressive distributed lag (ARDL) approach. The pool mean group (PMG) estimator performs well for both larger T and small N. Thus, the panel data used in this investigation fit the assumptions of the PMG estimator, which is why this study uses it. In other words, for this study, N is the sum of the five economies and T is the period of 32 years. Additionally, further presumption of the PMG estimator imposes a long-term uniformity restriction. Lesotho, South Africa, Namibia, Botswana, and Eswatini have formed a custom union, known as the Southern African Customs Union (SACU), and have similarities in languages, culture, social norms, historical past, and background. Consequently, these economies significantly affect each other.

The second step required testing for Granger causality. Granger (1969) introduced a fairly simple test that clarified the causation as follows: variable $y_t$ in the Granger logic is what causes variable $x_t$. Therefore, the historical values of the $y_t$ can be used to more precisely

examine $x_t$. Additionally, there must be any causality, whether unidirectional or bidirectional, between $x_t$ and $y_t$ .

The last stage requires checking the cross-sectional independence and normality of the residuals. In statistics and data analysis, it is common practice to assess whether a data sample is taken from a population that has a normally distributed population. One of the concepts associated with the classical linear regression model (CLRM) is normal. The residuals of the analyzed model are presumed to be normally distributed by the CLRM (Gujarati & Porter, 2008). Therefore, the normality test evaluates the null hypothesis that residuals are normally distributed. The criteria known as "cross-section independence" states that the residuals from the evaluated panel model must not depend on another variable (Pesaran, 2021). In essence, this means that there is no relationship between the cross-section residuals. Therefore, the cross-sectional independence test evaluates the null hypothesis that "there is no cross-sectional dependence." Furthermore, a well-quantified PARDL model must satisfy the normality test assumption and must also succeed in cross-section dependence tests.

## 4. RESULT AND DISCUSSION

This section provides estimated findings based on the interpretation of the results and data analysis. There are ten subsections in this section. Descriptive statistics were analyzed following the introduction. The correlation analysis is presented in the third subsection. The results of the panel unit root tests. The fifth sub-section represents the selection of the optimal lag. The cointegration test results. The long- and short-run results of the group model estimation are provided in the seventh subsection. The analysis of Granger causality is presented in the eighth subsection. The results of the diagnostic tests are provided in the ninth section to validate that the model is stable. The last section summarizes this section.

### 4.1 Descriptive statistics

Table 1 presents the statistical features of the data used in the model. The mean standard deviation, minimum, and maximum values, as well as the skewness and kurtosis of these variables were estimated and are presented in Table 1. When the skewness value is above zero, the distribution has a long-right tail; otherwise, when the skewness is below zero, the distribution has a long-left tail. The skewness values for LUNR, LGDP, LGE, LINF, and LIR are below zero; therefore, the distribution of these variables has a long-left effect.

**Table 1**: Descriptive statistics

| | UNR | GDP | GE | INF | IR | GFC |
|---|---|---|---|---|---|---|
| **Mean** | 20.650 | 3.046 | 25.105 | 7.351 | 13.101 | 24.503 |
| **Median** | 20.750 | 3.226 | 24.216 | 6.600 | 13.000 | 21.287 |
| **Maximum** | 28.770 | 12.270 | 43.482 | 21.600 | 23.363 | 74.822 |
| **Minimum** | 13.820 | -14.144 | 13.375 | 1.4300 | 5.250 | 11.825 |
| **Std.Dev** | 3.023 | 3.576 | 7.398 | 3.427 | 3.937 | 12.259 |
| **Skweness** | 0.384 | -1.055 | 0.529 | 1.116 | 0.266 | 2.250 |
| **Kurtosis** | 2.651 | 2.206 | 2.206 | 4.757 | 2.213 | 8.692 |

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

### 4.2 Correlation analysis

Table 2 shows the type of relationship between the variables under consideration. This relationship was obtained by conducting a correlation analysis of all the variables. The correlation analysis defines the size of the linear link between two or more variables. Moreover, the correlation is bound to lie between -1 and +1. where a correlation of +1 illustrates a perfect association between variables and a correlation of – 1 illustrates a perfect negative association between variables. A correlation score approaching zero merely means that there is not much proof of a linear association between two or more variables. As per the rule of thumb, multicollinearity is defined by an absolute correlation coefficient of >0.8 between two or more regressors.

**Table 2**: Correlation analysis

| | UNR | GDP | GE | INF | IR | GFC |
|---|---|---|---|---|---|---|
| **UNR** | 1.000 | -0.026 | -0.690 | -0.157 | -0.176 | -0.571 |
| **GDP** | -0.026 | 1.000 | -0.103 | 0.158 | 0.089 | 0.118 |
| **GE** | -0.690 | -0.103 | 1.000 | -0.062 | -0.090 | 0.559 |
| **INF** | -0.157 | 0.158 | -0.062 | 1.000 | 0.623 | 0.244 |
| **IR** | -0.176 | 0.089 | -0.090 | 0.653 | 1.000 | 0.212 |
| **GCF** | -0.571 | 0.118 | 0.559 | 0.244 | 0.212 | 1.000 |

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

As shown in Table 2, the correlations between the regressor variables are less than +-0.80, indicating that multicollinearity is not a problem for the projected model.

**4.3 Panel unit root test**

After presenting the descriptive statistics and correlation analysis, the initial step in the examination of the pool group involved conducting the unit root analysis. This analysis helps to determine whether individual variables exhibit a level of integration of I(0), I(1), or a combination of both, which is necessary to meet the assumption of the restriction test of the ARDL method. LLC and IPS unit root tests were used in this investigation to determine the order of integration of the relevant variables. Tables 3 and 4 show the unit root results for all key variables in this investigation. Table 3 shows the discoveries obtained from the LLC and IPS tests, indicating that variables such as GDP, INF, GFC, and IR are stationary at the 1, 5, and 10% levels of significance, respectively. Therefore, the GDP, INF, GFC, and LIR are integrated in the order of zero I (0).

**Table 3**: Panel unit root tests at level

| **Level** | | | | | | |
|---|---|---|---|---|---|---|
| | | **With Intercept** | | **With Trend and Intercept** | | |
| **Variable** | **Test** | **Statistic** | **P-Value** | **Statistic** | **P-Value** | **Order of Integration** |
| UNR | LLC | 0.370 | 0.646 | 0.232 | 0.592 | Not integrated |
| | IPS | -0.355 | 0.361 | 1.031 | 0.849 | Not integrated |
| GDP | LLC | 0.684 | 0.753 | 2.668 | 0.996 | Not integrated |
| | IPS | -4.929 | 0.000*** | -4.047 | 0.000*** | I(0) |
| GE | LLC | -0.670 | 0.251 | -0.137 | 0.446 | Not integrated |
| | IPS | 0.938 | 0.174 | -0.186 | 0.426 | Not integrated |
| INF | LLC | -4.393 | 0.000*** | -5.281 | 0.000*** | I (0) |
| | IPS | -2.900 | 0.002*** | -4.235 | 0.000*** | I (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| IR | LLC | 0.849 | 0.198 | -3.471 | 0.000*** | I (0) |
| | IPS | 0.653 | 0.743 | -3.137 | 0.001*** | I (0) |
| GFC | LLC | -0.595 | 0.276 | 1.241 | 0.893 | Not integrated |
| | IPS | -1.345 | 0.089* | 0.098 | 0.539 | I(0) |

Notes: */**/***signifies significance at 10%, 5% and 1%.

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

Table 4 shows the discoveries obtained from the LLC and IPS tests, indicating that variables such as UNR and GE become stationary after the first difference at the 1, 5, and 10% levels of significance. Therefore, UNR and GE were integrated in the order of one I (1).

**Table 4**: Panel unit root tests at first difference

| **First Difference** | | | | | | |
|---|---|---|---|---|---|---|
| | | **With Intercept** | | **With Trend and Intercept** | | |
| **Variable** | **Test** | **Statistic** | **P-Value** | **Statistic** | **P-Value** | **Order of Integration** |
| UNR | LLC | -1.691 | 0.045** | -0.253 | 0.400 | I (1) |
| | IPS | -3.470 | 0.000*** | -2.696 | 0.004*** | I (1) |
| GE | LLC | -5.715 | 0.000*** | -4.662 | 0.000*** | I (1) |
| | IPS | -7.507 | 0.000*** | -6.660 | 0.000*** | I (1) |

Notes: **, and *** denote significance at the 5%, and 1% levels, respectively.

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

### 4.4 Optimal lags selection

Choosing the optimal lag length is crucial to build the pool group mean model under the autoregressive distributed lag (ARDL) approach. As discussed in the preceding chapter, to decide the best model, the ideal lag length must be determined by employing appropriate model order selection criteria such as the SBIC, AIC, or HQC. The automatic model selection of the Eviews 12 software was used to determine the ideal lag length for this investigation. The maximum dependent variable and regressor lag of two were chosen for automatic

selection using the SBIC, AIC, and HQC to define selection criteria with a smaller value. AIC has the smallest value, as shown in Table 5. As a result, the ideal model chosen is ARDL(2,4,4,4,4,4).

**Table 5**: Criteria table indicating Optimal lag selection using ARDL

| Model | LogL | AIC | SIBC | HQC | Specification |
|---|---|---|---|---|---|
| 8 | 5.122 | 1.653* | 4.186 | 2.682 | ARDL(2.4,4,4,4,4) |
| 4 | -35.558 | 2.152 | 4.579 | 3.139 | ARDL(1,4,4,4,4,4) |
| 7 | -55.130 | 2.161 | 4.167 | 2.976 | ARDL(2,3,3,3,3,3) |
| 5 | -106.430 | 2.179 | 3.129* | 2.565 | ARDL(2,1,1,1,1,1) |
| 6 | -85.302 | 2.235 | 3.712 | 2.835 | ARDL(2,2,2,2,2,2) |
| 3 | -70.356 | 2.307 | 4.207 | 3.079 | ARDL(1,3,3,3,3,3) |
| 1 | -132.706 | 2.485 | 3.329 | 2.828* | ARDL(1,1,1,1,1,1) |
| 2 | -111.219 | 2.536 | 3.908 | 3.093 | ARDL(1,2,2,2,2,2) |

Notes: *signifies the lag order chosen by SIBC, AIC, and HQIC, separately.

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

### 4.5 Cointegration test

The findings of the unit root tests, which revealed that the variables were *I(0)* and *I(1)*, established a necessary aspect of the panel ARDL model. Therefore, a cointegration test should be estimated if the variables have mixed integration orders (Humpe & McMillan, 2020). The Kao panel cointegration test is used to check whether the variables are cointegrated. The null hypothesis for the Kao (1999) cointegration test is that no cointegration exists between variables. Table 6 demonstrates that, at the 5% level of significance, the null hypothesis for the Kao (1999) cointegration test is rejected because the probability for the calculated ADF t stats is less than all levels of significance. As a result, we may say that the variables are cointegrated and that there is a long-run correlation between the regressors and regressand.

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**Table 6:** Kao (1999) cointegration test results

| Test | ADF T-Statistic | Probability | Conclusion |
|---|---|---|---|
| Kao Cointegration Test | -1.940 | 0.026** | Cointegrated |

Notes: ** signifies significance at t5%.

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

**4.6 Long run and short run pool group mean estimates.**

The aim of this investigation was to use the PMG estimator, as stated in the section above. The PMG estimator fundamentally assumes that cross sections are identical in the long run and mixed in the short run. This essentially suggests that while short-run estimates differ among Namibia, South Africa, Eswatini, Botswana, and Lesotho, the PMG long-run estimates are identical throughout Namibia, South Africa, Eswatini, Botswana, and Lesotho. Hence, the ARDL model (2,4,4,4,4,4) was estimated using the pooled mean group (PMG) model estimator. Table 7 shows the long-run coefficient discoveries for Namibia, South Africa, Eswatini, Botswana, and Lesotho for 1990–2021.

**Table 7:** Long run regression

**Model: ARDL (2.4.4.4.4.4)**

| **Regressand: UNR** | | | | |
|---|---|---|---|---|
| **Regressors** | **Coefficient** | **Standard error** | **t-statistic** | **Probability** |
| IR | -0.499 | 0.091 | -5.471 | 0.000*** |
| INF | 0.429 | 0.149 | -2.881 | 0.007*** |
| GE | -0.362 | 0.054 | -6.761 | 0.000*** |
| GDP | -0.955 | 0.108 | -8.813 | 0.000*** |
| GFC | 0.038 | 0.026 | 1.474 | 1.159 |

Notes: *** signifies significance at 1% level.

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

The long-run influence of the regressor variables on unemployment, as given in Table 7, is shown using equation 8:

$$UNR = \alpha_i - 0.499IR + 0.429INF - 0.362GE - 0.955GDP + 0.038GFC \quad (8)$$

Equation 8 shows that the interest rate (IR), gross domestic product (GDP), and government expenditure (GE) have a long-run inverse association with unemployment (UNR). In addition, the findings show that inflation (INF) and gross fixed capital information (GFC) have a positive long-run association with unemployment. All variables, except gross fixed capital formation, are statistically significant in defining unemployment.

The results of panel autoregressive distributed lag model estimated are presented in Table 7. From Table, interest rate has negative and significant impact on unemployment in the investigated Southern Africa economies. The value of -0.499 suggests that a unit increase in interest rate led to a decrease in unemployment rate by -0.499 units in the countries under consideration, *ceteris paribus*. This does not support the view that higher interest rates make individual to lose confident from borrowing funds for investment purposes that are likely to create jobs and reduce unemployment rate. As a result, interest rates are among the factors that curb the unemployment rate in the countries of focus. The results failed to satisfy the expected sign of the interest rate coefficient. This negative influence is supported by Azolibe *et al.* (2022), who revealed a similar relationship in Nigeria, but insignificant.

The long-run results also reveal that a unit increase in inflation would result in an increase in unemployment by 0.429 units, *ceteris paribus*. These results contradict the expected sign of the inflation coefficient. The results also contradict the Phillips curve, which highlights that economic prosperity leads to inflation, which leads to more job opportunities, and as a result, lower unemployment. The results are also empirically supported by Folawewo and Adeboje (2017), whose study established a positive relationship between unemployment and inflation in the ECOWAS.

Government expenditure has an inverse long-term association with unemployment. A unit increase in government expenditure significantly reduces unemployment by 0.362 units, *ceteris paribus*. These results were consistent with the expected sign. Government expenditure in Namibia, South Africa, Eswatini, Botswana, and Lesotho is a fundamental factor in reducing unemployment. The findings are in line with Keynesian philosophy, which highlights that if the government increases its expenses on goods or services, prices will drop, and more goods and services will be available for consumer demand. However, businesses gain profit and employ more workers. This relationship is further supported by Azolibe *et al.* (2022), whose study established a similar relationship for South Africa.

Indeed, GDP is negatively associated with unemployment. A unit increase in GDP significantly decreases the unemployment rate by 0.955 units, *ceteris paribus*. The results are in line with the expected sign; hence, the GDP is capable of producing the expected results. The results support a trade-off between unemployment and gross domestic product, thus implying that Okun's law collectively does hold for Namibia, South Africa, Eswatini, Botswana, and Lesotho. In addition, this negative relationship is similar to that obtained by Folawewo and Adeboje (2017) for ECOWAS as well as Khumalo and Eita (2015) for Eswatini. However, the results deviate from those obtained by Sinha and Tseladikae (2018), whose established a positive impact for Botswana. Surprisingly, gross fixed capital information is positively associated with unemployed rate, but this association is insignificant. This basically imply that a unit increase in gross fixed capital would hardly affect unemployment rate.

**Table 8:** short run regression

**Model: ARDL (4.4.4.4.4)**

| **Predicted Variable: D(LUNR)** | | | | | |
|---|---|---|---|---|---|
| **Lagged variables** | **NAMIBIA** | **SOUTH AFRICA** | **ESWATINI** | **BOTSWANA** | **LESOTHO** |
| **D(UNR (-1))** | 0.007<br>(0.548) | -0.715<br>(0.000)*** | 0.9111<br>(0.000)*** | 0.218<br>(0.001)*** | -0.485<br>(0.003)*** |
| **D(IR (-1))** | 0.391<br>(0.000)*** | -0.233<br>(0.001)*** | -0.266<br>(0.000)*** | 0.379<br>(0.354) | 0.018<br>(0.014)** |
| **D(INF (-1))** | -0.080<br>(0.003)*** | 0.114<br>(0.002)*** | -0.033<br>(0.002)*** | -0.646<br>(0.000)*** | 0.039<br>(0.000)*** |
| **D(GE (-1))** | -0.751<br>(0.000)*** | 0.084<br>(0.579) | 0.243<br>(0.000)*** | 0.199<br>(0.187) | 0.109<br>(0.000)*** |
| **D(GDP (-1))** | 0.563<br>(0.001)*** | -0.218<br>(0.002)*** | -0.031<br>(0.056)* | 0.553<br>(0.000)*** | 0.036<br>(0.001)*** |
| **D(GFC (-1))** | 0.335<br>(0.000)*** | -0.129<br>(0.308) | -0.033<br>(0.002)*** | -0.646<br>(0.000)*** | 0.012<br>(0.000)*** |
| **ECT(-1)** | -0.665<br>(0.000)*** | -0.161<br>(0.001)*** | -0.129<br>(0.000)*** | -0.759<br>(0.000)*** | -0.279<br>(0.000)*** |

Notes: *, **, and *** signify significance at the 10%, 5%, and 1% levels.

P-values are inside the brackets ()

Table 8 displays that the effect of macroeconomic indicators has varying short run influence in unemployment in Namibia, South Africa, Eswatini, Botswana, and Lesotho respectively. The error correction term (ECT) for all economies shows a negative sign and significant in the short run, which infers that if the variables under examination drift from equilibrium in the short run, they will move back to the equilibrium in the long run. The coefficient of ECT for South Africa, Botswana, Namibia, Lesotho, and Eswatini is with the speed of adjustment of 16.1, 75.9, 66.5, 27.9 and 12.9% respectively. The economy of Botswana and Namibia moves quickly to attain a stable state since their adjustment speeds are greater than 50%. Conversely, the economy of Eswatini, South Africa and Lesotho and move slowly to attain a stable state since their adjustment speeds are less than 50%

In the short run, the interest rate has a significant positive link with unemployment for all economies except Botswana. Similarly, government expenditure has a positive link with unemployment for all economies, except South Africa and Botswana. Additionally, inflation has a positive effect on unemployment in South Africa and Eswatini. Meanwhile gross domestic product has a positive link with unemployment in Botswana, Lesotho, and Namibia. Lastly, gross fixed capital inform has an inverse with unemployment in Botswana, South Africa and Eswatini. These mixed effects were expected, as the PMG ADRL assumes that short-run estimates must vary across all economies. Additionally, the effects of macroeconomic indicators are significant in most economies.

**4.7 Causality test**

In this study, the Granger causality test was used to examine the direction of cointegration. The granger causality test's null hypothesis claims that $xt$ does not Granger cause $yt$. Conversely, the alternative hypothesis claims that $xt$ does Granger cause $yt$. The Granger test is undertaken at maximum lag of 2.

**Table 9**: Causality test results

| **Null Hypothesis** | **Obs.** | **F-Statistic** | **Prob.** | **Decision** |
|---|---|---|---|---|
| IR does not Granger Cause UNR | 145 | 0.402 | 0.669 | No Causality |
| UNR does not Granger Cause IR | | 0.191 | 0.826 | |
| INF does not Granger Cause UNR | 145 | 0.016 | 0.984 | No Causality |

| | | | | |
|---|---|---|---|---|
| UNR does not Granger Cause INF | | 0.019 | 0.980 | |
| GE does not Granger Cause UNR | 145 | 3.088 | 0.049** | GE ⇔ UNR |
| UNR does not Granger Cause GE | | 3.714 | 0.027** | |
| GDP does not Granger Cause UNR | 145 | 1.343 | 0.264 | No Causality |
| UNR does not Granger Cause GDP | | 0.397 | 0.673 | |
| GFC does not Granger cause UNR | 145 | 1.859 | 0.159 | UNR ⇒ GFC |
| UNR does not Granger cause GFC | | 2.901 | 0.05 | |

Notes: ** signifies significance at the 5% level.

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

The findings in Table 9 report that at the 5% level of significance, we reject the null hypothesis that "UNR does not Granger Cause GFC" as a result, we conclude that there was unidirectional causality moving in only one direction. In addition, we reject the null hypothesis that ""GE does not Granger Cause UNR," "URN does not Granger Cause GE" hence concluding that there was a bidirectional causality between UNR and GE. Conversely, the null hypothesis in any of the remaining cases cannot be ruled out at all levels of significance, hence concluding that there was no causality IR and UNR, INF and UNR and UNR, GDP and UNR.

**4.8 Residuals Diagnostics Post-Estimation**

To ensure that the findings produced by the PMG ARDL model were valid and trustworthy, post-estimation diagnostic tests were performed. A well-specified model must satisfy the hypothesis of the normal test and must additionally pass the criteria for the cross-section.

**Table 10**: Residuals diagnostics test results

| **Test** | **Null hypothesis** | **Type of the test** | **Test Stat.** | **Probability** | **Decision** |
|---|---|---|---|---|---|
| **Normality test** | The residuals are normally distributed | **Jacque-Bera** | 4.683 | 0.096 | Failing to rule out the null hypothesis |

| | | | | | |
|---|---|---|---|---|---|
| | | **Pesaran cross-section dependence test** | 0.414 | 0.679 | Failing to rule out the null hypothesis |
| | | **Bias corrected LM dependence test** | -0.277 | 0.782 | Failing to rule out the null hypothesis |
| **Cross-Section Independence tests** | No cross-sectional dependence exists. | **Pesaran scaled LM dependence test** | -0.184 | 0.854 | Failing to rule out the null hypothesis |
| | | **Breusch and Pagan LM dependence test** | 9.177 | 0.515 | Failing to rule out the null hypothesis |

Source: Estimation by the author using Eviews 12 with data from Statista and the World Bank.

Table 10 displays that for normality test we fail to reject the null hypothesis at any level of significance, given that the probability value for the test statistics is greater than all the levels of significance. Thus, we can conclude that the residuals are normally dispersed. Furthermore, cross-section independence test findings indicate that the null hypothesis cannot be ruled out at all levels of significance. This leads us to the conclusion that the estimated residuals do not serially correlate.

**4.9 Discussion of the results**

The main goal of this investigation is to identify the nature and extent of the effect of macroeconomic indicators on the unemployment rate in Namibia, South Africa, Eswatini, Botswana, and Lesotho collectively, which is fulfilled by means of the PMG ARDL model estimator that imposes the hypothesis of similarity over the long run and heterogeneity over the short run. Therefore, the influence of macroeconomic indicators on unemployment in

South Africa, Botswana, Namibia, Lesotho, and Eswatini is similar over the long run and mixed over the short run.

In the long run, the study reported that interest rates, government spending and gross domestic product have an inverse and significant impact on unemployment. The economic implication of the reported findings is that an increase in either interest rate, government spending or gross domestic product reduces unemployment in the selected Southern African economies. In addition, an increase in interest rates reduces the unemployment rate. This implies that individuals, companies, and businesses in the countries under investigation can easily obtain loans despite higher interest rates. As loans are obtained, consumer demand rises, thereby increasing employment to meet the high demand in the economy.

In the long run, an increase in government spending reduces the unemployment rate, thereby increasing demand for goods and services, which puts pressure on businesses to hire more workers, thus contributing to a lower unemployment rate. Additionally, an increase in gross domestic product reduces the unemployment rate, indicating high consumer spending on goods and services. This, in turn, leads to high productivity and hiring by businesses to meet demand, subsequently resulting in a low unemployment rate.

The inflation rate was reported to have a positive and significant impact on the unemployment rate. The economic implication of this impact is that an increase in inflation leads to a high unemployment rate. The inflation rate in the countries under investigation could be associated with high production costs such as raw materials or salaries. Therefore, it could be for this reason that a positive relationship between the unemployment rate and inflation rate was established in this investigation, implying that businesses respond to the inflation rate by decreasing their workforce to preserve profitability, resulting in increased unemployment.

## 5. CONCLUSIONS AND POLICY RECOMMENDATIONS

This study is motivated by the growing importance of unemployment and macroeconomic indicators in developing economies. Nonetheless, little has been explored about the impact of macroeconomic indicators on employment in developing economies, especially in South African economies. The economies of South Africa, Botswana, Namibia, Lesotho, and Eswatini currently face job shortages, and the level of unemployment has been unpredictable over the past years.

The main objective of this study is to discover the nature and extent of the effect of macroeconomic indicators on the unemployment rate in South Africa, Botswana, Namibia, Lesotho, and Eswatini collectively for the period 1990–2022. In the long run, the estimated PMG ARDL model suggests that macroeconomic indicators, namely interest rates, gross domestic product, and government expenditure, have an inverse relationship with unemployment, while inflation and gross fixed capital formation have a positive relationship with unemployment. All variables, except the gross fixed capital formation, have a significant impact on unemployment.

A rise in the unemployment rate in South Africa, Botswana, Namibia, Lesotho, and Eswatini is statistically and significantly associated with an increase in inflation and government expenditure. One of the remedies lies in the administration of South Africa, Botswana, Namibia, Lesotho, and Eswatini. By concentrating more on developing appropriate policies that alleviate the burden of high production costs for producers, such as absorbing a portion of these costs, governments can help prevent workforce reductions and maintain current employment levels, thus mitigating high unemployment rates.

In addition, a decline in unemployment rate is statistically and significantly associate with an increase in government expenditure. Therefore, appropriate policy that stimulates government spending should be implemented as it has the capacity to boost demand. This further calls on the fiscal authorities in South Africa, Botswana, Namibia, Lesotho, and Eswatini to develop ways to ensure that government expenditures are directed to activities that directly and indirectly promote employment generation, and fiscal authorities should bailout industries that are struggling but labor intensive. All of this will aid in saving jobs and creating employment.

The results also revealed that a decline in unemployment in South Africa, Botswana, Namibia, Lesotho, and Eswatini is statistically and significantly associated with an increase in gross domestic product. This negative association between unemployment and gross domestic production is known as job growth. This reflects the ability of the local economy to generate employment. Gross domestic product plays a significant role in determining unemployment. Hence, policymakers should develop policies or strategies to monitor the movement of gross domestic product and promote sustainable gross domestic product.

This study had the limitation of focusing only on the impact of selected macroeconomic indicators on unemployment, and overlooked other factors that might affect unemployment. Therefore, further research should be conducted to assess the impact of other factors such as population, political instability, and crime.

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The author has no conflicts of interest.

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