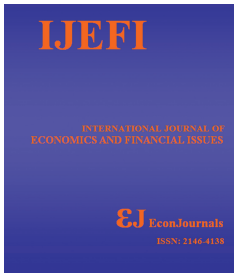

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Factors Influencing Poverty in South Africa: Time Series Analysis

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ABSTRACT

Poverty is an emerging issue that is being debated upon in both developed and developing countries, including South Africa. This research investigates the factors that affect poverty in South Africa, as well as the theoretical connections between poverty and the country's key macroeconomic variables using annual time series data for 1996-2019. The stationarity test found that some variables were not stationary at the level but were after first differencing; the cointegration test demonstrated that the variables under investigation have a long-term relationship. The VECM findings revealed that the ratio of agriculture to GDP has a negative short-run relationship with poverty rates, while domestic credit to the private sector, foreign direct investment, growth rate, and gross enrollment ratio have a negative short-run relationship with poverty rate, but statistically significant. Domestic credit to the private sector, foreign direct investment, growth rate, and gross enrollment ratio all have a negative long-run relationship with poverty rate, while agriculture to GDP and military spending have a positive but statistically insignificant long-run relationship with poverty rate. To encourage more private sector investment in economic development and poverty alleviation, the South African government must create an open business climate with attractive regulatory incentives.

Keywords: Lower Bound Poverty Line, Foreign Direct Investment, Economic Growth, SA
JEL Classifications: C22, C50, E60, E62

1. INTRODUCTION

Poverty is an emerging issue that is being addressed and debated upon in a number of developed and developing countries, including South Africa. It stifles growth and changes that are brought on by factors, such as social, political, educational, economic and cultural. One of the major unresolved issues is the lack of consistency in establishing levels of living standards across countries. Poverty causes people to be pessimistic about the consequences of market-oriented and growth policies (Akhtar et al., 2017; Adriana, 2016). Poverty victims also suffer from malnutrition, illness, crime, family disintegration, indignities, and even death, according to Kammerman and Kahn (1997, cited in Seipel, 2003). Adriana (2016) agrees, adding that hunger, malnutrition, disease, housing, illiteracy, and other poverty-related problems are obstacles that most developing countries strive to solve. In South Africa, despite the robust implementation of many government poverty-alleviation policies and programs, poverty remains the country's biggest problem (Madikizela and Ntshaka, 2010).

Poverty is described as a situation in which an individual lives below the poverty line and is unable to meet basic needs, such as food, shelter, and health. Poor people's voices are totally ignored in their countries, for example, in politics; they are powerless and have no say in crucial matters that affect them daily. Poor people are the victims of any economic shocks that occur in the world; in reality, poor people pay more for their daily survival than rich people, but, ironically, rich people earn more (Afandi et al., 2017). Poverty is an conspicuous predictor of economic suffering that plagues most third-world nations, including South Africa (Rostitawati et al., 2019). For the purposes of this study, poverty

is described in monetary terms; it is not having enough money to meet one's basic needs. Poverty lines are used to differentiate various types of poverty. The three different categories of poverty lines used in South Africa are - the food poverty line (FPL), the lower bound poverty line (LBPL), and the upper-bound poverty line (UBPL). The FPL is the rand value below which people cannot afford to purchase or consume enough food to meet their daily energy needs for good health. Individuals at the LBPL lack the financial means to purchase or consume adequate food and non-food products, and are therefore forced to sacrifice food in order to obtain necessary non-food items. Individuals can buy enough food to feed themselves and their families at the UBPL (Stats SA, 2020).

South Africa has three national poverty lines for official statistical purposes, however, the lower-bound poverty line has emerged as the chosen threshold for the country's poverty-reduction objectives outlined in the Medium-Term Strategic Framework (MTSF), National Development Plan, and Sustainable Development Goals (Stats SA, 2017). As a result, one of the country's goals is to reduce the proportion of the population living in poverty from 39% in 2009 to zero by 2030 (Stats SA, 2017). In order for South Africa to meet its 2030 goal, the proportion of people living below the poverty line (LBPL) must also decline by 2.67% points every year for the next 15 years (Stats SA, 2017). In light of this, the current study uses the R840/person/month Lower Bound Poverty Line (at April 2020 prices). This is consistent with Stats SA (2017), which reported that LBPL is the preferred measure of poverty since it is used to set national poverty reduction goals.

Using the national lower bound poverty line of R840/person/month to assess poverty in South Africa as the area of study, from 1996 to 2019, the proportion of people living below the LBPL increased from 55.7% to 57.2% to 57.3% and to 57.3% to 23.4 million, 24.5 million, 24.9 million and 25.2 million people in 1996, 1997, 1998 and 1999 respectively, and droped to 56.6% in 2000. The share of people living below the lower -bound poverty line increased between 2001 and 2003, indicating an upward trend. In 2001, the poverty rate rose from 55.5% to 55.9% in 2002 and 2003, respectively. This amounted to 25.1 million, 25.6 million, and 25.9 million people, respectively. In 2004 and 2005, the figures dropped to 52.4% and 49.3%, respectively, before rising to 49.8% in 2006. People living below the lower-bound poverty line were 48.4% in 2007, 49.2% in 2008, 46.5% in 2009, and 40.7% in 2010. From 2011 to 2019, the poverty rate as measured by the LBPL rose or increased, as shown by the following percentages: 35.4%, 36.6%, 37.3%, 38.5%, 39.0%, 41.8%, 43.2%, 43.6%, and 44.8%. This corresponds to 18.4 million, 19.4 million, 20 million, 21 million, 21.7 million, 23.5 million, 24.7 million, and 26.3 million people, respectively (World Bank, 2020; HIS Global Insight, 2020). Low and poor economic growth, continuing high unemployment levels, lower commodity prices, higher consumer prices, lower investment levels, greater household reliance on credit, policy uncertainty and global finacial crises are all contributing to this upward trend. The explanation for this is that from these economic strains, South African households' standards of living are deteriorating, causing poverty among many families and individuals (Stats SA, 2017).

As previously noted, one alarming feature of South African poverty is its downward and upward trend or volatility, which appears to be on the rise rather than subsiding. It is widely assumed that poverty is multidimensional in nature, hence, it is critical to identify the key factors that affect it, even though, there is no agreement about how macroeconomic factors, such as inflation, unemployment, government spending, and economic growth impact on poverty indices (Kashi and Tash, 2014, Imani et al., 2018). Poverty is affected by many economic and social factors in a country, and there has been a lot of debate about how to address these factors. It is difficult to pinpoint the exact cause of income disparity, whether from price indices or shifts in investment opportunities, also, how to get the levels down (Mansi et al., 2020).

There are a number of studies that look at the fators that affect poverty. Biyase and Zwane (2018) determine the factors that influence poverty and household welfare in South Africa. The results, from fixed effect and random effect probit, indicate that levels of education of the household head, provincal characteristics, race of the household head, dependency ratio, gender of the household head, employment status of the household head and marital status of the household head are statistically significant determinants of household welfare. They also found that, compared to traditional rural areas (used as reference category), households living in urban and farms are less likely to be poverty-stricken. Baiyegunhi and Fraser (2010) empirically assessed the dynamics of poverty and identified the determinants of households' vulnerability to poverty in the Amothole District Municipality of the Eastern Cape Province. They found that the number of vulnerable households is significantly larger than for the currently poor households; the vulnerability index was found to be 0.62 compared to 0.56 headcount index. The result of the Probit model shows that the age, level of education and occupation of the household head, dependency ratio, exposure to eccentricity risks and access to credit are statistically significant in explaining a households' vulnerability to poverty. All variables, thus, were found to be statistically significant in explaining a household's vulnerability to poverty.

Garidzirai and Sekhampu(2013) investigated the perceived causes of poverty in the South African Township of Kwakwatsi. The objective of the study was to investigate if participants pereceived causes of poverty in individualistic, structural or fatalistic terms and the impact of socioeconomic factors, from the residents' perceptions, on the causes of poverty. They find age, marital staus, education, gender, employment staus and income of the participants were significant predictors of all the indices. They find that the variable, household size, had no significance in all the three indices. Kgaphola (2015) investigated factors that influence poverty in South Africa using annual data from 1996 to 2013. The main findings of the study were that there is a negative relationship between poverty and government expenditure on health, housing, energy, public order and safety, and access to credit in South Africa. Government expenditure on education is found not to reduce poverty in South Africa, neither is unemployment found to increase poverty in South Africa.

This paper looks at the factors that influence poverty in South Africa. It differs from that of Kgaphola (2015) in that it uses the

most recent data. The previous author used data from 1996 through 2013, while the current study used data from 1996 to 2018. Another difference is that the macroeconomic variables incorporated in this study, include: agricultural ratio to gros domestic product, ratio of Foreign Direct Investment to GDP, ratio of the Primary education, ratio of the domestic credit to private sector and military expenditure as percentage of GDP, while Kgaphola (2015) used health, housing, enegry, public order and safety, access to credit, education and unemployment. Other studies, for example, those conducted by Biyase and Zwane (2018); Baiyeguhi and Fraser (2010) and Garidzirai and Sekhampu (2013) investigated the influence of demographic characteristics (age, education, gender, race, dependency ratio, employment status, marital status, occupation of the household head and income of the participant) on household poverty in South Africa. Most of these studies used a binary variable as dependent variable, while this paper used as a dependent variable, poverty headcount and lower-bound poverty line. These are some of the gaps in the literature that the current study attempts to fill.

Povery alleviation is at the top of developing countries' agendas because a large portion of their population lives in poverty, a major impediment to these countries' economic growth. Being poor is a complex phenomenon with many determinants with macroeconomic varaibles having the greatest impact on poverty. Macroeconomic variables have a greater impact since they influence policies, controlling the running of countries. Variables, like gross domestic product (GDP) agricultural production, education, foreign direct Investment,(FDI), domestic credit, inflation, and other macroeconomic variables are the most commonly identified included. It is, therefore, essential to comprehend how these influence poverty in a country. There is no systematic empirical study analyzing the macroeconomic determinants of poverty in South Africa using the most recent data on macroeconomic variables and the lower- bound poverty line in South Africa, hence, this study attempts to fill this information gap. Developing countries' governments, such as South Africa's, have adopted policies aimed at alleviating poverty. The aim of this research is to find out how certain macroeconomic variables affect poverty in South Africa as the findings should be useful to government and policymakers in monitoring these variables.

The rest of the paper is structured as follows: The second section reviews the literature; the third section outlines the study methods; the fourth section gives the results and discussion; and the fifth section presents the conclusion and policy implications.

2. LITERATURE REVIEW

This section deals with the review of some related literatures on this topic by surveying the findings of some scholars, researchers and writers.

2.1. GDP and Poverty

Tahir et al. (2014) investigated the impact of growth rate on poverty of Pakistan using secondary data collected covering the period of 1980 - 2012. The results revealed the negative relation between the GDP growth rate on poverty. It was found that 1% increase in GDP growth rate has a significantly negative impact on 1.9% on poverty. The growth elasticity of poverty calculated was −0.00035205, which is highly less elastic, indicating that 296.50% increase in GDP growth rate decreases poverty by only 0.1043% while the relationship between GDP growth rate and poverty was found to be negative. The implication was that as GDP growth rate increases, poverty decreases and vice versa. In terms of Head Count Ratio, the relationship between GDP and poverty was found to be deterministic because for each value of the independent variable (GDP growth rate) there is one and only one corresponding value of dependent variable (HCR). In Nigeria, Omoniyi (2018) examined the relationship between poverty and economic growth, the determinants of economic growth and poverty from 1980 to 2013 using an error correction model to analyse the time series data. The study revealed that economic growth has a negative and significat relationship with poverty. The coefficient of the variable −1.52E −06 indicates that 1% increases in economic growth may have led to about a 1.52% reduction in poverty in Nigeria during the period of the study. Similarly, the negative impact of economic growth on poverty was also supported by Wijayi (2020) and Kashi and Tash (2014) in their studies conducted in Banjarnegara and Iran, respectively.

2.2. Foreign Direct Investment and Poverty

Anigbogu et al. (2016) investigated the effect of foreign direct investment on poverty reduction in Nigeria using an econometric model of the Ordinary Least Square (OLS). Findings revealed that foreign direct investment and trade openness are statistically significant in explaining poverty reduction in Nigeria. This means that, foreign direct investment increase will bring about a decline in poverty. Finding from a study by Ogunniyi and Igberi (2014) prove that FDI has a positive but insignificant impact on real per capita income and has the potential of reducing poverty in Nigeria. Israel (2014) investigated the relationship between FDI and poverty reduction in Nigeria using Cointegration and Error Correction Model (ECM) and Augmented Dickey-Fuller test with annual time series data covering the period between 1980 and 2009. The results from Error Correction model uncovered a short run relationship among the variables under study. The ECM results showed that poverty reduction is positively related to FDI; this means that FDI does have a positive relationship on poverty reduction. Using a standard unit root test (the Augmented Dickey-Fuller test), the study found that each variable is non-stationary in first differences, suggesting a possibility for co-integration. Using standard co integration tests (Engle- Granger and Johansen-Julius), the study found that the variables are co integrated, suggesting that there exists a short run relationship among them. Ucal (2014) investigated the relationship between FDI and poverty by using econometric model on unbalanced panel data in selected 26 developing countries, from UNCTAD, over a period of 24 years from 1990 to 2009. The findings revealed that there is a statistically significant relationship between FDI and poverty. Pervez and Rizvi (2014) explored the determinants of poverty in Pakistan; they applied the Ordinary Least Square and VECM for the sample period, from 1980 to 2010. The study concluded that FDI has negative but insignificant impact on poverty in Pakistan. Ogunniyi and Igberi (2014) examined the influence of Foreign Direct Investment (FDI) on Poverty Reduction in Nigeria using secondary

data over the period 1980-2015. The Ordinary Least squares (OLS) regression method was applied for the data analysis with the aid of the E-views statistical package. The result of the analysis showed that FDI, although, it has an inverse relationship with the poverty rate, yet it was not statistically significant, however, the overall results as shown by the F-statistics confirmed that Foreign Direct Investment exert enough influence on the poverty rate.

2.3. Military Expenditures and Poverty

Olofin (2012) examined the relationship between the components of the military's spending on poverty in Nigeria for the period 1990-2010. The results show that military expenditure per soldier and military participation rate, were positively related to poverty indicator; both were found to be statistically significant. Military expenditure, thus, was negatively related to poverty level. Akhtar et al. (2017) found that military expenditure has positive and significant impact on poverty. Henderson (1998) examined the extent to which military spending is associated with poverty in the United States for the period 1959 - 1992. The study revealed that increased military spending is associated with increasing poverty; however, there is an inverse relationship between wartime military spending and poverty and a direct relationship between peacetime military spending and poverty. Similarly, Kalim and Hassan (2014) investigated the impact of public defence spending on poverty using ARDL Bounds Testing Approach for the period from 1976 to 2012, in Pakistan. The study reveals that public defence spending has significant and accelerating impact on poverty in both lon- run and short-run in Pakistan.

2.4. Education and Poverty

Garza - Rodriguez (2016) examined the determinnats or correlates of poverty in the Mexican States bordering the United States. The data used came from the 2008 National Survey of Income and Expenditures of Households. A logistic regression model was estimated to determine which variables might be important in explaining poverty in the region. High educational level of the household head was found to be negatively correlated with the probability of being poor. This means that a strong inverse relationship between the level of education and poverty incidence was found. Similarly, Pervez (2014) investigated the impact of education on poverty reduction in Pakistan; an Augmented Dickey-Fuller, Causality and Johansen cointegration methodology with time series data was used in this study. The study revealed that Literacy rate and Gross Enrolment have negative and significant impact on poverty in the long-run, while life expectancy has positive impact on poverty. Pervez (2016) also conducted a study on the role of education in poverty elimination in Pakistan with special reference to South Punjab. The results of the study show that education has significant impact on poverty level of people, while another hypothesis depicted that education improves the employment status of people. The results of the study also show that people's education has a direct and significant impact on the income of respondent; this improves the living standard of people and consequently, the eradication of poverty. Chikelu (2016) examined the impact of human capital development on poverty reduction in the Nigerian economy, from the period 1986 to 2012. The study used the Ordinary Least Squares (OLS), Augmented Dickey-Fuller and Johansen Co-integration methods to estimate the model of one dependent variable (poverty rate) and four explanatory variables (primary school enrolment, secondary school enrolment, tertiary school enrolment and per capita income). The study revealed that there exists a relationship between human capital development and poverty reduction in Nigeria. Chaudhry (2009) investigated the factors affecting rural poverty using Logit regression modeling based on primary source of data, in the project area of Asian Development Bank. The study revealed that rural poverty can be alleviated by: Lowering the household size, persons per room and dependency ratio, improving education, more female labor participation, higher household participation rate, as well as improving assets and households' access to market, especially, in remote areas. Malik (1996) investigated the reasons as to how some of the landless households managed to escape poverty, whereas some cultivating households failed to do so. The main factors responsible for this outcome were found to be favourable/unfavourable distribution of land by size of landholds, household size, educational attainment, depending ratio, and age of the household head. The results suggest that poverty is most severe among the population with no educational attainment. It was found that both the level of intensity and the factors' contribution to total poverty declined as the level of educational attainment increases. Likewise, Talukdar (2012) found that there is a negative relationship between educational attainment and poverty. The negative coefficient on SECSCHENR (secondary school enrolment ration expressed as percentage of population) means that higher educational attainment reduces poverty and lower educational attainment would increase poverty.

2.5. Private Investment and Poverty

Simon-Oke and Olayemi (2014) investigated the relationship between Foreign Private Investment, Capital Formation and Poverty reduction in Nigeria, using co-integration and Error correction Mechanism (ECM), as well as Granger Causality tests with annual time series data covering the period, 1978 and 2008. The various tests demonstrated that the inflow of foreign Private Investment in Nigeria has not significantly contributed to poverty alleviation in the country. The study also showed that government investment in health and education has not helped to reduce poverty in Nigeria. The recommendations from the study were that the government, at all levels, should encourage the inflow of foreign private investment and intensify efforts at curbing capital flight. This would expand government spending on education and health sectors, coupled with the expectation that proper accountability and transparency on the part of the government would reduce poverty to the bearest minimum in Nigeria.

2.6. Agricultural Growth and Poverty

Viet Cuong (2011) investigated the impact of production of crops, forestry, livestock and aquaculture on household welfare, poverty and inequality in rural Vietnam, using fixed-effects regressions. Data used in this were from Vietnam Household Living Standard Surveys 2002 and 2004. The findings indicated that, impact estimates of the production of crops and forestry on per capita income and consumption expenditure are not statistically significant. Impact estimates of the livestock production were positive and statistically significant for per capita income, but not statistically significant for per capita expenditure, however,

agricultural production has positive and statistically significant impacts on both income and expenditure. Ogundipe et al. (2016) examined the effect of agricultural productivity on poverty reduction in Africa using the dynamic panel data approach estimate using the System-GMM technique for the period 1991-2015. The empirical results suggested that agricultural-value added, per worker, contributes significantly to reducing rural poverty in Africa. On the other hand, food production index and GDP per capita were more important factors in curbing urban and dollar poverty, implying that the non-farm poor tends to have a large food marginal propensity to consume (MPC). The insignificance of GDP per capita in dwindling rural poverty reflects that reality growth in other sectors does not influence the livelihood of the rural-poor farmers due to farming's subsistence nature. Finally, domestic credit to private sectors and institutions were significant in reducing all categories of poverty, with the largest impact on rural poverty. Similarly, in their study, Fan et al. (2000) used a simultaneous equation model and time series (1978-1997), cross section (25 provinces) data to analyze the differential impact of different types of public investments on growth and poverty reduction in rural China. The results show that growth in agricultural production, higher agricultural wages, and increased non-agricultural employment opportunities have all contributed significantly to reducing rural poverty.

3. RESEARCH METHODOLOGY

This section discusses the method and procedures employed in carrying out this, particularly, the procedures for collecting and analyzing data. The data for the study were collected from World Development Indicators and South African Reserve Bank for the period 1996-2019; this period was chosen because of the availability of secondary data for the analysis.

3.1. Model Specification

The model for the study was based on the empirical work of Akhtar et al. (2017) with modification. The variables which are under consideration in this study include: Headcount index was replaced by the Lower bound poverty line (LBPL) which was used as proxy for poverty and served as the dependent variable, while gross primary enrollment ratio, ratio of FDI to GDP and the ratio of agriculture GDP to total GDP, ratio of the domestic credit to private sector, ratio of the military expenditure as percentage of GDP were the indepent variables. In addition, GDP growth rate as the proxy for economic growth was also addeded in the model as a new variable.

The model is specified in a functional form as follows:

$$Poverty=f(GER,DC,ME,FDI,AGRI,RGDP) \quad (1)$$

The econometric form of the model can be expressed as:

$$Poverty_t=\beta\beta_0+\beta\beta_1\ GER_t+\beta\beta_2DC_t+\beta\beta_3ME_t+\beta\beta_4FDI_t+\beta\beta_5AGR_t+\beta\beta_6RG\ DP_t+\mu t \quad (2)$$

Where:

Poverty rate = Lower bound- poverty line

GER = Gross enrollment ratio, primary education

DC = Domestic credit to private sector as percentage of GDP

ME = Military expenditure as percentage of GDP

FDI= Ratio of FDI to GDP

AGRI = Ratio of agriculture GDP to GDP

RGDP = Proxy for Economic Growth

β_0 = Constant term

$\beta_1-\beta_6$ = Parameters to be estimated

μ_t = stochastic error term

The study adopted the Lower-bound- poverty line, as it is adopted by the authoritative National Planning Commission (NPC) with regard to its poverty targets "as outlined in the [National Development Plan] NDP" (Stats SA, 2014, p.14). According to Stats SA (2017), the lower – bound poverty line has emerged as the preferred threshold in policy-making and monitoring. South Africa's poverty reduction targets are based on the lower-bound line in the Mediu, Term Strategic Framework, National Development Plan and Sustainable Developmenmt Goals.

3.1. Estimation Techniques

3.1.1. Unit root test

According to Ogunniyi and Igberi (2014) and Chebet (2016), regression of a non- stationary time series data on another non-stationary time series may cause a spurious regression or claptrap regression; they may indicate a relationship between variables which does not exist. In the econometrics insight, Augmented Dickey-Fuller (ADF) tests are used to assess whether time series variables are non-stationary or have a unit root (Shrestha and Bhatta, 2018). The null hypothesis under the ADF test assumes that all variables have a unit root and the alternative hypothesis "no unit root (stationary)" (Paparoditis and Politis, 2016).

3.1.2. Co-integration test

Co-integration tests are designed for non-stationary variables, in order to know the long-run relationship between variables. The method of co-integration was introduced by Granger (1981) and the basic purpose was to protect the losses of long-run information of data which occurs due to time series. The linear combination of variable is, I(1) and also I(0), then variables are said to be co-integrated with each other and requires that time series data to be non-stationary, at the level and stationary at the first difference. The Johnnes co-integration test is used in this regard. Co-integration of two or more series suggests that there is a long run relationship between them (Akhtar et al., 2017).

3.13. Diagnostic tests

Residual diagnostic tests include normality test to check whether the error term was normally distributed; Heteroskedasticity to check whether the variance of the residuals was constant and serial

correlated; this is to check whether the error terms from different time periods were correlated (Chebet, 2016).

4. RESULTS AND DISCUSSION

4.1. Unit Root test

In this study, like in any studies that use time series data, variables are first tested for stationary. An Augmented Dickey Fuller test (ADF) was used to check the stationary of variables at level and also at 1st difference and the results are presented in Table 1 below.

The results in Table 1 show that all variable contained a unit root at levels. This is shown through the computed absolute t-values which are less than the critical values at 1% and 5% level of significance. For instance, the computed ADF values Lngri_ratio −0.785927 (gross enrolment ratio), Lnd_credit −2.1652137 (Domestic credit) and Lnfdi −2.12111 (foreign direct investments) respectively are less than critical values at 1% and 5% as shown in Table 1. Similarly, the computed P-values for variables in levels are greater than a 5% level of significance. This means the null hypothesis of having a unit root is not rejected, however, after 1st differencing all computed ADF values are greater than test critical statistics, for example, (Lnagri-ratio – 4.597660, Lnge_ratio – 4.483885 and Lnmil_exp – 8.877489, respectively, are greater than the computed test critical values at 1% and 5% as shown in Table 1. As such, the null hypothesis "presence of unit root" is rejected at 1st difference, hence the series become stationary after the first differencing. At this stage, it is important to determine the optimal number of lags before performing the cointegration test and VEC modelling and the results are shown in Table 2.

Table 1: Results of ADF unit root test

Variable	Levels		1st difference	
	Critical values	P-values	Critical values	P-values
Lnagri_ratio	0.785927* 3.831511** 3.029970***	0.8002	4.597660* 3.831511** 3.029970***	0.0020
Lnd_credit	2.1652137* 3.75294** 2.99806***	0.2232	4.953441* 3.769597** 3.004861***	0.0007
Lnfdi	2.12111* 3.752946** 2.999053***	0.34102	4.978759* 3.808546** 3.020686***	0.0008
Lngr_rate	0.213411* 3.788030** 3.012363***	0.9825	6.009272* 3.788030** 3.012363***	0.0001
Lnge_ratio	1.731364* 3.769597** 3.004861***	0.4025	4.483885* 3.769599** 3.004861***	0.0020
Lnlbpl	1.628170* 3.769597** 3.004861***	0.4521	4.7058355* 3.769597** 3.004861***	0.0089
Lnmil_exp	0.747794* 3.769597** 3.004860***	0.9904	8.877489* 3.769597** 3.004861***	0.0000

Source: Author's computation: E-views Output (2021) (*denotes Augmented Dickey-Fuller test statistics, ** denotes test critical values at 1% and *** denotes test critical values at 5%)

4.2. Lag Order Selection

Lag order selection is usually done to suggest the lags that should be used to limit the autocorrelation challenges. The study made use of the Akaike Information Criterion (AIC) to determine the number of lags to be used and the results are shown in Table 2.

Table 2 shows that results for lag order selection and in this regard, AIC was considered. The value under AIC determines the optimal lags to be used and as shown in Table 2, two lags were chosen for this model. Having determined the number of lags (1), it was fundamental to perform the Johansen Cointegration test to determine if there is at least one cointegrating equation in the model and the results are shown in Table 3.

4.3. Johansen Cointegration Test

The Johansen cointegration test is generally used to test cointegrating relationships between several time-series data (Guirguis, 2018). This is done through comparing the tests to the Engle-Granger test, as the Johansen test allows for more than one cointegrating relationship. If all variables included in the test are integrated of order one, the next step I is to test the existence of a co-integration relationship between the variables under consideration (Akhtar et al., 2017). The results are presented in Table 3.

The results in Table 3 under Trace show that the computed critical value (125.6154) at a 5% level of significance is less than the Trace Statistic (264.6205) and the P-value of 0,0056 is less than 5%. This shows that the null hypothesis of no cointegrating equation is rejected at a 5% level of significance. Analogous results are also noted under Maximum Eigen Statistics where the computed critical value (46.23142) is less than the maximum Eigenvalue (82.74929). The computed P-value of 0.0006 probability reveals that the null hypothesis of no cointegrating equation is rejected, however, the computed P-values under Trace (0.4213) and Maximum Eigenvalue (0.5432) are >5%, hence, the null hypothesis of, at most, one cointegrating equation is not rejected. As such, the results indicate the long-run relationship between the poverty rate and other explanatory variables in the model. The next section presents the short and long-run dynamics between the endogenous and exogenous variables in the model.

4.4. Vector Error Correction Model (Short-run Dynamics)

The error correction model (ECM) is regarded as a time series regression model that is grounded on the behavioural assumption that two or more-time series exhibit an equilibrium relationship that determines both short-run and long-run association (Ararso, 2021). The results in Table 1 show that the time-series data is stationary in levels after the first differencing necessitated by the ECM; the results are presented in Table 4.

Results in Table 4 above show that at least one variable is statistically significant since the computed probability are less than 5% and the corresponding t-statistic is >2, are statistically significant and were interpreted in the study. The ratio of agriculture to GDP (Lnagri_ratio) has a negative short-run

Table 2: Lag order selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	21.63863	NA	0.012492	1.563863	−1.265143	−1.505549
1	32.89726	14.63622*	0.004531	2.589726	−2.241220	−2.521694
2	35.76472	3.440959	0.003822*	2.776472*	−2.378180*	−2.698721*
3	35.95333	0.207462	0.004237	2.695333	−2.247253	−2.607863
4	35.95336	3.22e−05	0.004822	2.595336	−2.097470	−2.498147

Source: Eviews Output (2021). * indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Table 3: Results of Johansen test for co-integration (Trace and Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	
None *	0.976747	264.6205	125.6154	0.0056
At most 1 *	0.943915	21.8712246190177	95.75366	0.4213
At most 2 *	0.898193	18.4918610580562	69.81889	0.6432
At most 3 *	0.805354	18.22897476003261	47.85613	0.5621

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) P-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.976747	82.74929	46.23142	0.0006
At most 1 *	0.943915	23.379096	40.07757	0.5432
At most 2 *	0.898193	50.26289	33.87687	0.6759
At most 3 *	0.805354	18.4541112	27.58434	0.79828

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) P-values

Table 4: VEC model

Dependent Variable: D(LNLBPL)				
Method: Least Squares				
Variable	Coefficient	Std. error	t-statistic	Prob.
D(LNMIL_EXP (−2))	−0.011426	0.044960	−0.254141	0.8024
D(LNGE_RATIO (−2))	−0.292489	1.022949	−0.285927	0.7784
D(LNG_RATE (−2))	−0.012498	0.027151	−0.460323	0.6511
D(LNFDI (−2))	−0.020412	0.026148	−0.780646	0.4457
D(LND_CREDIT (−2))	0.074469	0.345780	0.215365	0.8320
D(LNAGRI_RATIO (−2))	−0.781104	0.213247	−3.662915	0.0019
C	4.105503	4.602954	0.891928	0.3849
R-squared	0.749457	Mean dependent var		3.854949
F-statistic	8.475428	Durbin-Watson stat		0.508819
Prob(F-statistic)	0.000234			

relationship with the poverty rate (Lnlbpl). The computed P-value of 0.0019 is <5% and the corresponding t-statistic of 3.6629 (in absolute terms) is >2, hence, statistically significant results. This means that holding other things constant, a unit increase in the ratio of agriculture to GDP increases by one unit and the poverty rate decreases by 0.78 units. In terms of growth rate, gross enrolment ratio, military expenditure, and foreign direct investment were found to have a negative short-run association with the poverty rate but the results are statistically insignificant as shown in Table 4. Furthermore, the coefficient R-squared of 0.75 (2dc) which measures the speed of adjustment shows approximately 75% of the error in the short run is corrected in the first quarter as the condition in the economy resorts to its equilibrium. This indicates a strong pressure on the poverty rate in re-establishing short-run equilibrium, every time there is a shock to the economy. The speed of adjustment is statistically significant at 5% with an absolute f-value of approximately 0.000234. In this regard, the study further checked for a long run association between poverty rate and other explanatory variables in the model.

4.5. Vector Error Correction Model (VECM)

The vector autoregressive (VAR) model is regarded as a general framework used to define the short-run dynamic interrelationship among stationary variables (Bringmann et al., 2018). It is a technique that can be used by macroeconomists to characterize the joint dynamic behaviour of a collection of variables, without requiring strong restrictions of the kind needed to identify underlying structural parameters. The results from, at most, one cointegrating equation necessitated the use of VECM and the results are shown in Table 5 below.

The results in Table 5 presents the VECM results of the model. The variables are cointegrated of the same order and it shows a long-term relationship among the variables in the model. The constant coefficient of 0.514824 shows that the previous year's deviation from the long-run equilibrium is corrected in the current period at an adjustment speed of 51%. The long-run relationship between poverty rate and control variables for one cointegration vector is presented below:

Lnlbpl = −0.514824 +0.428782 Lnagri_ratio −1.11536 Lnd_credit – 0.05300 Lnfdi −0.06206 Lng_rate + 0.071516 Lnmil_exp – 3.009853 Lnge_ratio (3)

Equation 1 is expressed using VAR results in Table 5 above. The results show that, domestic credit to private sector, foreign direct investment, economic growth (growth rate) and gross enrollment ratio, have a negative long-run relationship with the poverty rate.

In terms of impact of domestic credit to private sector on poverty, the result conform to the findings by other studies, such as Ogundipe et al. (2016) and Akhtar et al. (2017). This is, however, contrary to the results from Dilawar et al. (2012) that found a positive relationship between domestic credit and poverty in Pakistan. With regard to foreign direct investment, this finding is similar to other studies, Akhtar et al. (2017), Ucal (2014) and Ogunniyi and Igberi (2014) that found a negative and significant relationship between forign direct investment and poverty. The negative and significant effect of economic growth rate on poverty is similar to the previous studies by Tahir et al.(2014), Kashi and Tash (2014) and Wijaya (2020) that prove that, as economic growth rate increases, poverty decreases. These are studies that also suggest a negative relationship between gross enrollment ratio of primary education and poverty, Pervez (2014), Garza - Rodriquez (2016), Pervez (2016), Chikelu (2016) and Talukdar (2012).

The ratio of agriculture to GDP and military expenditure has a positive association with the poverty rate in the long run. As such, a percentage increase in the ratio of agriculture to GDP leads to a 0.42% increase in the poverty rate. This is contrary to our hypothesis and inconsistent with the studies done by Akhatar et al. (2017) and Viet Cuong (2011) who found a negative relationship. This implies that agricultural growth would stimulate economic growth in non-agricultural sectors, which in turn results in increased employment and reduced poverty.

Another interesting finding is the positive effect of military expenditure on poverty which is insignificant. This implies that a 1% increase in military expenditure results in a 0.07% increase in the poverty rate in South Africa, holding other factors constant, although, in the long run, military expenditure is positively related to poverty rate. This finding is consistent with our hypothesis and with the studies done by Olofin (2012), Akhtar et al. (2017), Henderson (1988) and Hassan (2014). A unit increase in domestic credit to the private sector, foreign direct investment, growth rate and gross investment ratio, may result in a poverty rate decrease; for instance, a 1% increase in domestic credit to the private sector results in a 1.1% decrease in the poverty rate in South Africa. The ratio of agriculture to total GDP and military expenditure results, however, are statistically insignificant since the computed t-statistic values of 0.86058 and 1.31230, respectively, are below two. Eventually, domestic credit to private sector, foreign direct investment, economic growth (growth rate) and gross enrollment ratio are statistically significant since the computed t-statistics are >2 as shown in Table 5. At this point, diagnostic checks for the model in consideration are presented below.

Table 5: VECM (Long run dynamics)

Variable	Coefficient	Standard error	t-statistic
Constant	−0.514824	-	-
Lnlbpl	1.000000	-	-
Lnagri_ratio	0.428782	0.49825	0.86058
Lnd_credit	−1.11536	0.07019	22.9583
Lnfdi	−0.05300	0.00474	−11.1834
Lng_rate	−0.06206	0.00546	−11.3678
Lnmil_exp	0.071516	0.05450	1.312300
Lnge_ratio	−3.009853	0.14236	−21.1431

4.6. Diagnostic Analysis

To check for the best fit of the model, Lagrange Multiplier (serial correlation), white noise (conditional heteroscedasticity) and Jarque-Bera (normal distribution) were used in this study.

Table 6 presents the Diagnostic analysis tests results. First, the Lagrange multiplier (LM test) was conducted under the null hypothesis of "no serial correlation". The computed probability of 0.3226 is greater than a 5% significance level, hence, the null hypothesis of "no serial correlation" is not rejected. Second, Chi-square was employed and the null hypothesis states that conditional heteroscedasticity is not rejected since the computed P-value of 0.0888 is greater than a 5% level of significance. Third, the jarque-Bera (JB) test was employed and the null hypothesis that the series is normally distributed is not rejected, since the P-value of 0.2633 is greater than the 5% level of significance. As such, the results show that the series used does not suffer from no serial correlation, no conditional heteroscedasticity and is normally distributed.

Table 6: Diagnostics analysis

Test	Null hypothesis	t-statistic	Probability
Lagrange Multiplier (LM)	No Serial correlation	39.34244	0.3226
White (Ch-sq.)	No conditional heteroscedasticity	10.98474	0.0888
Jarque-Bera (JB)	There is a normal distribution	3.52000	0.2633

5. CONCLUSION AND POLICY IMPLICATIONS

Using data from 1996 to 2019, this study shows how major macroeconomic variables influence poverty in South Africa. Multi diagnostic tests were used in conjunction with the Johansen co-integration technique. Agriculture's GDP ratio, FDI, education enrollments, domestic credit to the private sector, military spending, and other macroeconomic variables were analyzed in this report, and the findings indicate that all of these variables, with the exception of agriculture and military expenditure, have a substantial impact on poverty in South Africa; in relation to economic growth, a high rate of growth has a major negative effect on poverty.

In addition, the study finds that gross primary school enrollment has a long-term effect on poverty. As a result of this observation, it can be concluded that schooling assists in the elimination of poverty and the development of individuals' and society's socioeconomic status. The population of the poor can be reduced by educating more people in the country. This research also found that the portion of domestic credit to the private sector has a major effect on poverty. In South Africa, the private sector plays an important role in determining the country's job situation; as a result of a rise in jobs, poverty rates are decreased, thus, there is a negative relationship between poverty and providing credit to the private sector. The study's findings revealed that foreign direct investment has a substantial negative impact on poverty in South Africa. In the receiving countries, FDI creates jobs, new technology is acquired, human capital is created, domestic investment is increased, tax revenue is increased, and foreign trade is integrated. Many of these FDI gains are the key drivers of poverty reduction. Defence spending has an important positive effect on poverty in South Africa, as shown by this report. Increased military spending has a trade-off impact on other productive sector spending, resulting in lower spending on productive sectors, such as education and development. As a result of these declines, the country's poverty rate increases.

Some policy guidelines are suggested based on the results of this study and these are outlined in the discussions below. The government should establish quality institutions to improve the level of economic growth and macroeconomic factors such as low inflation, export orientation and low labor taxes should be encouraged. To support the fact that education is an engine of social stability and resilience, it must be provided in an inclusive, equitable, and meaningful manner across South Africa. Through policy implications and budget allocation, the South African government should make additional efforts to ensure the quality and coverage of education, thereby, the curse of poverty can be avoided by investing in high-quality education. The South African government should increase expenditure on education, because it is generally belived that increased government spending on education has by far the largest impact on poverty. Domestic credit to private sectors has a significant and negative impact on poverty, therefore, the South African government should encourage private sectors to operate in the country by lowering the interest rate so that domestic credit to private sectors can be easily provided. The government should follow policies that enable banks to channel more funds into the private sector for investment. The negative effects of FDI on poverty in South Africa, means that labor-intensive industries will eradicate poverty, more effectively. South Africa, like other developing countries, has a competitive advantage in labor-intensive production, therefore, the South African government could promote more FDI in labor-intensive industries; incentives for international investors, the formulation of investment-friendly policies, and the management of the country's law and order challenges should all be included in this strategy. The government must ensure an open business-operating environment with attractive legislative incentives to attract more investments from private sectors for economic development. The government must encourage entrepreneurship and investment by lowering the risks and costs of doing business, including removing barriers to formalization. The study recommends the provision of adequate infrastructure and policy framework that will be conducive for investors for doing business in South Africa. An effective strategy for attracting foreign investment would also be to make the South African economy very attractive to domestic investors, first.

Despite the fact that there are several other variables that may have a greater impact on poverty in South Africa, this paper was unable to consider a longer time series in the study due to a lack of data. In light of the data limitations, the focus was on four major influencing factors of poverty: agricultural GDP to total GDP ratio, education enrollment ratio, domestic credit-to-private-sector ratio, military expenditure, and foreign direct investment ratio (FDI). For another angle to the South Africa's poverty situation, this research could be performed on provincial levels. I also propose that a similar study be carried out in the future but at the regional level, with a longer time series and a larger number of variables.

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