



Munich Personal RePEc Archive

Inflation, interest rate and economic growth nexuses in SACU countries

Taderera, Christie and Runganga, Raynold and Mhaka,
Simbarashe and Mishi, Syden

Nelson Mandela University, University of Zimbabwe

19 January 2021

Online at <https://mpra.ub.uni-muenchen.de/105419/>
MPRA Paper No. 105419, posted 25 Jan 2021 02:46 UTC

INFLATION, INTEREST RATE AND ECONOMIC GROWTH NEXUSES IN SACU COUNTRIES

Christie, S. Taderera¹

Department of Economics & Economic History, Nelson Mandela University, Port Elizabeth

Raynold Runganga²

Department of Economics, University of Zimbabwe, Harare, Zimbabwe

Simbarashe Mhaka³

Department of Economics & Economic History, Nelson Mandela University, Port Elizabeth

Syden Mishi⁴

Department of Economics & Economic History, Nelson Mandela University, Port Elizabeth

Abstract

Various theories ascertain that there is a positive relationship between inflation and interest rate. Developed and developing economies are still in search of an optimum inflation rate that increases economic growth. The SACU members has recorded low growths levels over the past years coupled with low inflation rates. This study examines the relationship between inflation rate, interest rate and economic growth in Southern African Customs Union (SACU) countries. Panel data for SACU countries covering the period 1991 to 2018 was analysed using Pooled Mean Group (PMG) estimators which are Panel Autoregressive Distributed Lag (ARDL) model, Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) to enable isolating short and long run effects and for robustness. The results of the study show that inflation has a positive impact on economic growth while lending rate has a negative impact on growth in the long run. These results imply that policymakers should allow a high sustainable inflation rate in order to promote economic growth while interest rate can be used as a monetary policy instrument to achieve the desired inflation rate that will affect economic growth positively.

Keywords: *Inflation, Interest rate, Economic growth, Southern African Customs Union*

1. Introduction and Background

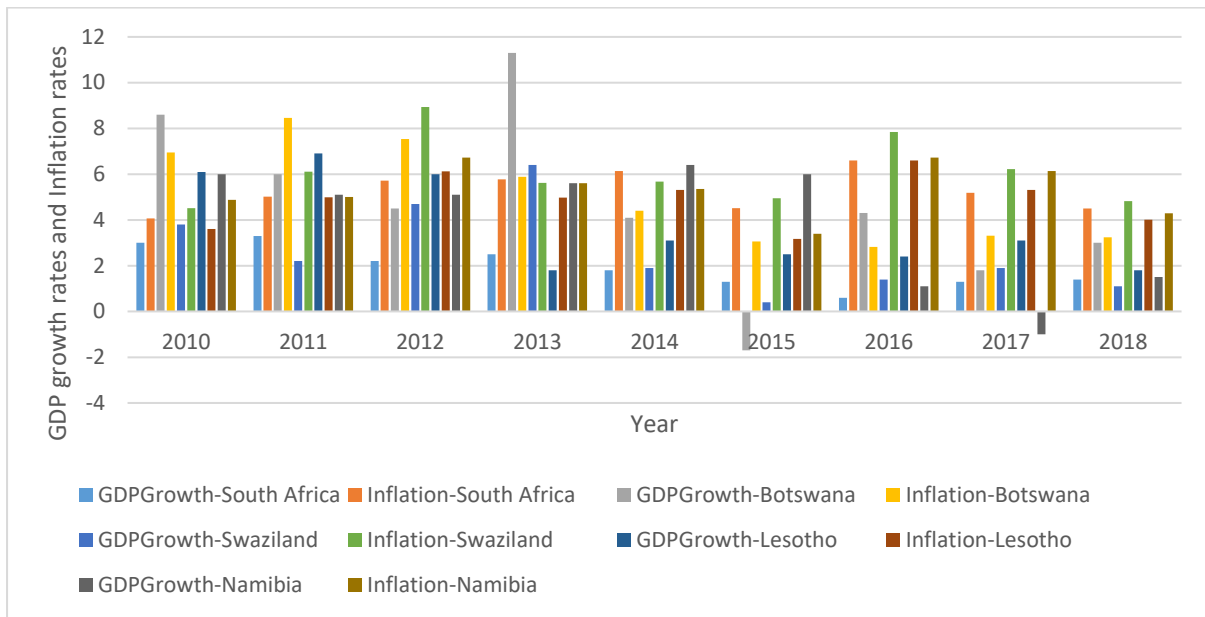
Maintaining price stability is essential for achieving economic growth. This is achieved through monitoring inflation rate and maintaining a low and stable rate through the use of monetary policy instruments such as interest rate. Central banks have a mandate to attain price stability together with other macroeconomic objectives such as economic growth and high employment (Southern African Customs Union, 2013). In some instances, however, central banks can have the dual mandate of attaining price stability and achieving set level of economic growth or employment, among other alternatives (Bhattacharyya, 2012). The debate on which approach is the best rages on across the world. Developed and developing economies are still in search of an optimum inflation rate that increases economic growth. This study seeks to take this debate further, focusing on a group of countries with customs agreement and largely aligned macroeconomic policies, the Southern African Customs Union (SACU).

The geographic proximity of the SACU members and the alignment at large of macroeconomic policies such as monetary and exchange rate policies and international trade and investment linkages makes the group a befitting natural experiment to draw the debate to some logical conclusion. The SACU region recorded an average growth of 1.3% in 2017 compared to 0.8% in 2016 and in 2019, the highest projected growth rate of 3.8% was recorded in Botswana, with the lowest growth rate of 1.7% recorded in South Africa and Swaziland (African Development Bank Group, 2019; Southern African Customs Union, 2018). Compared to inflation rates during the same period, inflation has been on a downward trajectory in the SACU region (Southern African Customs Union, 2018). It appears that attainment of price stability is possible and necessary, however it is not sufficient for economic growth. According to the World Bank Group (2018), gross domestic product (GDP) growth in the SACU region decelerated in 2016 and 2017 and recovery is not expected to be strong enough especially in South Africa. South Africa with the inflation targeting monetary policy has maintained inflation rate between 3%-6% and interest rate is maintained at 6.75% but gross domestic product growth rates and employment levels plummeted. It becomes an issue of concern as to why maintaining very low inflation, sacrificing growth. This arose the interest on examining the relationship between inflation rate and economic growth in SACU region since theoretical literature is not convincing and interest rate is one to the instruments used by central banks in controlling inflation to achieve growth.

From a theoretical point of view, different perspective exists regarding the relationship between inflation and economic growth. For instance, while the monetarists view pioneered by Milton Friedman (1967) posit that inflation is harmful to growth in the long-run, the *structuralists* argue that inflation enhances economic growth. Tobin (1965) support this argument, asserting that money is a substitute for capital and inflation raises the opportunity cost of holding money, thereby increasing capital accumulation and economic growth. Stockman (1981) considers money to be complementary to capital, thereby causing inflation to have a negative impact on economic growth, an outcome known as the anti-Tobin effect. Contrary to all these theories, Sidrauski (1967) established that money is neutral and super-neutral, causing inflation to have no impact on economic growth. These different perspectives regarding the relationship between inflation and economic growth shows that low inflation levels may be or may not be growth sacrificing.

Due to the adverse outcomes of high inflation levels on macroeconomic stability, some central banks such as the South African Reserve Bank (SARB) in 2000 and Bank of Ghana (BOG) in 2002 adopted inflation targeting framework, maintaining low inflation levels (Mavikela *et al.*, 2019). The popularity of inflation targeting framework arose following the 1997-1998 Asian financial crisis and the International Monetary Fund's advocacy for Central Banks to combine both flexible exchange rate regime and inflation targeting policy (Phiri, 2012). Inflation targeting framework appears to be popular in industrialised countries considering that only two Central Banks in African countries, the SARB and BOG adopted the fully-fledged inflation targeting framework (Mavikela *et al.*, 2019). However, whether inflation targeting is a desirable option to achieve growth is worth investigating. According to the World Bank Group (2018), the general economic downturn in SACU region and contraction of per capital income in Namibia and South Africa contributed to increase in poverty in the region. The desirability of maintaining low inflation to achieve favourable economic growth is worth exploring given low economic growth and very low inflation levels being experienced by SACU countries. Figure 1 below shows that while GDP growth rates in SACU countries have been falling over the period 2010 to 2018, there is no much variation in inflation rates among these countries with Botswana being the only country having inflation rate which is much different from other countries. This might be because all other SACU members currency are pegged at par with the rand except the Pula of Botswana. Changes in the South African inflation rate is likely to have spillover to the Common Monetary Area members.

Figure 1: GDP growth and Inflation rates of countries in the SACU region



Source: Author's Illustration using Data from World Development Indicators (2019).

The low economic growth rates and high inflation rates that have been reported in many developing countries following the global financial crisis. This raised many concerns that has caused many researchers to estimate the relationship between economic growth and inflation rate. In the context of SACU region, no country had inflation rate more than 9% between 2010 and 2018 but growth of GDP has been falling. This has motivated us to investigate the relationship between the growth of GDP and inflation rate in the SACU region so as to determine if increasing inflation will stimulate growth. Incorporating interest rate for it is a monetary instrument used to influence inflation. In this study, we make use of the Pooled Mean Group (PMG) estimators. to examine the relationship between inflation, interest rate and economic growth in the SACU region.

2. Theoretical and Empirical Literature Review

Various theories exist in trying to explain the relationship between inflation, interest rate and economic growth and among these include the Monetarist Theory pioneered by Milton Friedman (1967). The theory posits that increasing money supply at a faster rate than the growth in the economy result in inflation, which is harmful to economic growth. In an attempt to influence inflation and economic growth, interest rate control can be used, where there is a change in the short-term interest rate by the Central Bank (Bain and Howells, 2003). However,

the impact of monetary policy changes is not direct and affect through different channels. Expansionary monetary policy leads to a decrease in real interest rates and investment spending will increase, leading to an increase in aggregate demand. The rise in aggregate demand lead to increase in price level economy output. This implies a negative relationship between interest rate and economic growth and a negative relationship between interest rate and inflation.

The classical theory by Adam Smith (1776) and developed by Ricardo (1817) assumes that an economy always attains full employment through the invisible hand, allowing flexibility in prices, wages and other input prices. The full employment assumption shows that an increase in Aggregate Demand (AD) following monetary policy changes do not have an impact on the level of output but result in inflation, hence inflation and output growth are not correlated. However, the Keynesian theory by Keynes (1936) assumes a positive relationship between inflation and economic growth in the short run only. The theory is centred upon the AD and Aggregate Supply (AS) framework and in the short run, inflation and output are not correlated due to stickiness of wages and prices. In the long run, inflation and output are not related due to full employment while in the intermediate phase, inflation and output are positively related due to flexibility of prices and wages.

In support of the theoretical relationship, empirical studies have been reviewed to observe this relationship in various countries and mixed findings were obtained as well. The Table 1 below summarises the studies of Harswari and Hamza (2017), Karahan and Yilgor (2017), Stawska (2016), Sattarov (2011), Thanh (2015), Pradhan, Arvin and Bahmani (2015) and Holston *et al.* (2017) for developed countries. All these studies examined the relationship between inflation, interest rate and economic growth with the exception of Sattarov (2011) and Thanh (2015) who examined the relationship and the threshold level of inflation for economic growth.

Table 1: A Summary of the Empirical Literature on Developed Countries

Author (s)	Countries/ Region	Period	Method	Dependent Variable	Independent Variables	Results	Implications for this study
Harswari and Hamza(2017)	20 Asian countries	2006-2015	OLS	GDP, FDI, INF	IR	Interest rate has a negative impact on Gross Domestic Product and Inflation	There is likely going to be a negative relation between interest rate and GDP.
Karahan and Yilgor (2017)	Turkey	2002-2016	VAR	CPI	IR	There is a unidirectional relationship between inflation and interest rate in Turkey.	There is no consensus on the causal relationship, the results likely to be subjective for each country.
Stawska (2016)	Poland	2000-2014	OLS	GDP	CPI	There is a positive relationship between inflation and economic growth.	The global financial crisis of 2001 and 2009 have significant impact on the inflation and interest rate as well as monetary policy and economic growth.
Sattarov (2011)	Finland	1980-2010	VAR	GDP	INF	Inflation and economic growth have a positive relationship.	There exists a threshold at which inflation rate allows for highest growth rate.
Thanh (2015)	Indonesia, Malaysia, Philippines, Thailand & Vietnam	1980-2011	PSTR	GDP	INF	The study finds that for inflation rates above the 7.84 percent threshold level, there is a statistically significant negative relationship between inflation and growth.	There exists a threshold for inflation at which a rate above would lead to a negative relationship between inflation and economic growth.
Pradhan <i>et al.</i> , (2015)	OECD countries	1960-2012	PVAR	GDP	INF	There is a positive relationship between inflation and economic growth.	Stock markets as indirect variable influences the relationship between inflation and economic growth for developed countries differently from developing countries.
Holston <i>et al.</i> ,(2017)	USA, Canada, Euro area and United Kingdom	1965-2015	Laubach–Williams	GDP	IR	There is a negative long run relationship between interest rate and economic growth.	There exist to be different global factors that tend to influence country by country economic performance.

Note: GDP = Gross Domestic Product, FDI = Foreign Direct Investment, INF = Inflation rate, EXCH = Exchange rate, IR = Interest Rate, CPI = Consumer Price Index, OLS = Ordinary Least Squares, VAR = Vector Autoregression, PSTR = Panel Smooth Transition Regression, PVAR = Panel Vector Autoregression.

As shown in the table above, Harswari and Hamza (2017) and Stawska (2016) used Ordinary Least Squares estimation technique to investigate the relationship while Karahan and Yilgor (2017) and Sattarov (2011) used Vector Autoregressive model. The rest of the studies used different techniques to analyse the relationship. Harswari and Hamza (2017) and Holston *et al.* (2017) found a negative relationship between interest rate and economic growth while Karahan and Yilgor (2017) found a positive relationship between inflation and interest rate. The rest of the studies found a positive relationship between inflation and economic growth, with Sattarov (2011) and Thanh (2015) showing a threshold level of inflation for economic growth where this relationship change.

In developing countries, several studies have been done on the relationship between inflation, interest rate and economic growth. Examples include studies by Akume *et al.* (2016), Seleteng *et al.* (2013), Havi and Enu (2014), Denbel *et al.* (2016), Ayres *et al.* (2014), Agbaba (2018), Imleesh *et al.* (2017), Mallick and Sousa (2013), Eggoh and Khan (2014) and Kasidi and Mwakanemela (2013).

Table 2 shows that Seleteng *et al.* (2013), Imleesh *et al.* (2017) and Eggoh and Khan (2014) used the Panel Smooth Transition Regression (PSTR) method. However, Njimanted *et al.* (2016), Denbel *et al.* (2016) and Mallick and Sousa (2013) used the VAR methodology while the rest of the studies used different methodologies to infer the relationship between inflation, interest rate and economic growth.

Njimanted *et al.* (2016), Havi and Enu (2014), Denbel *et al.* (2016), Agbaba (2018), Eggoh and Khan (2014) and Kasidi and Mwakanemela (2013) shows a negative relationship between inflation and economic growth, while Ayres *et al.* (2014) and Imleesh *et al.* (2017) found a positive relationship between inflation and interest rate. In addition, Imleesh *et al.* (2017) found a positive relationship between interest rate and economic growth while Seleteng *et al.* (2013) found a non-linear relationship between inflation and economic growth.

Table 2: A Summary of Empirical Literature on Developing Countries

Author (s)	Countries/ Region	Period	Method	Dependent Variable	Independent Variables	Results	Implications for this study
Njimanted <i>et al.</i> (2016)	CEMAC	1981-2015	VAR	GDP	IR, MS, INFL	There is a negative relationship between inflation rate, interest rate and economic growth.	Monetary policy variables influence the customs unions differently. Effective monetary targeting and policies should be implemented with no political motives.
Seleteng <i>et al.</i> (2013)	SADC	1980-2008	PSTR	GDP	INF	The findings show an 18.9 percent threshold, above which inflation is detrimental to the SADC region's economic growth.	There exists a threshold for inflation at which a rate above would lead to a negative relationship between inflation and economic growth.
Havi and Enu (2014)	Ghana	1980-2012	OLS	GDP	IR, INFL, EXCH	There is a negative relationship between inflation, interest rate and economic growth.	Monetary policy is more effective in achieving economic growth by pegging proper interest and inflation rates.
Denbel <i>et al.</i> (2016)	Ethiopia	1970-2011	VAR	INF	GDP	Inflation is negatively and significantly affected by economic growth.	The relationship between inflation and economic growth is bidirectional rather than one way.
Ayres <i>et al.</i> (2014)	Developing countries	1985–2010	OLS	GDP	INF	While the overall impact of targeting inflation on real GDP is small, there is only a statistically significant increase in real GDP in certain areas, including Europe, Latin America and the Middle East.	Inflation targeting can positively impact the GDP growth for developing countries but its skewed to certain regions such as Europe and Latin America.
Agbaba (2018)	Nigeria	1984-2014	PPMCC	GDP	INF, MS	Negative relationship between inflation and economic growth.	Aggressive and tight control of the money supply is necessary to keep inflation under check.

Imleesh <i>et al.</i> (2017)	Indonesia, Malaysia and Singapore	1990-2015	PSTR	GDP	INF, IR	There is an insignificant positive long run relationship between interest rate and economic growth and also a significant positive long run relationship between inflation and economic growth.	There is need to consider other control variables, important for economic growth such as exchange rate and crude oil prices for economic growth to be achieved.
Eggoh and Khan (2014)	Developed and developing economies	1960-2009	PSTR	GDP	INF	The relationship between inflation and growth is inverse and nonlinear.	There exists a threshold for inflation at which a rate above would lead to a negative relationship between inflation and economic growth.
Kasidi and Mwakanemela (2013)	Tanzania	1990-2011	ILS	GDP	INF	There is a negative short run relationship between inflation and economic growth.	Low inflation rate contributes to higher economic growth.

Note: GDP = Gross Domestic Product, FDI = Foreign Direct Investment, INF = Inflation rate, EXCH = Exchange rate, IR = Interest Rate, CPI = Consumer Price Index, OLS = Ordinary Least Squares, VAR = Vector Autoregression, PSTR = Panel Smooth Transition Regression, PVAR = Panel Vector Autoregression, MS = Money Supply, ILS = Indirect Least Squares, PPMCC = Pearson Product-Moment Correlation Coefficient.

Studies have also been done by Chipote and Makhetha-Kosi (2014), Mothuli and Phiri (2018), Sindano (2014), Salami (2018) and Vermeulen (2015) on the relationship between inflation, interest rate and economic growth focusing on the SACU countries and the results of these studies are shown in table 3.

Table 3: A Summary of Literature on SACU countries

Author (s)	Countries/ Region	Period	Method	Dependent Variable	Independent Variables	Results	
Chipote and Makhetha-kosi (2014)	South Africa	2000-2010	VAR	GDP	MS, Repo Rate, CPI, EXCH	The study shows that there is a long-term relationship between variables.	Monetary policy is more effective in promoting domestic and foreign direct investment. Government spending is complementary to achieve economic growth.
Mothuli and Phiri (2018)	Botswana	1975-2016	ARDL	GDP	INF	Inflation is found to be insignificantly related with economic growth over both the short and long-run.	Some economies may be irresponsive to inflation rate changes, rather other variables such as exchange rate and government size may influence economic growth.
Sindano (2014)	Namibia	1980-2012	OLS	GDP	INF	There is a positive relationship with an inflation threshold of 12.0 per cent, which is conducive to Namibia's economic growth.	There exists a threshold for inflation at which a rate above would lead to a negative relationship between inflation and economic growth.
Salami (2018)	Eswatini	1980-2016	OLS	GDP	INF, IR, EXCH	The outcome exhibit that interest rate have a negative and significance with GDP. The INF showed a positive relationship with the GDP.	There is need to consider other control variables, important for economic growth such as exchange rate and inflation rates for economic growth to be achieved.
Vermeulen (2015)	South Africa	1950-1985	OLS	GDP	INF	Negative relationship between inflation and output in the long run.	Low inflation targeting policy adopted by South Africa is conducive for economic growth.
Bonga and Kengne (2018)	South Africa	1969-2013	MSVAR	INF	GDP	There is no relationship between inflation and economic growth.	Response of economic growth is regime dependent and subject to the reaction of monetary policy to inflation changes.

Note: GDP= Gross Domestic Product, FDI = Foreign Direct Investment, INF = Inflation rate, EXCH = Exchange rate, IR = Interest Rate, CPI = Consumer Price Index, OLS = Ordinary Least Squares, VAR = Vector auto regression, PSTR = Panel Smooth Transition Regression, PVAR = Panel Vector Auto Regression, MS = Money Supply, ILS = Indirect Least Squares, PPMCC = Pearson Product-Moment Correlation Coefficient, ARDL = Autoregressive-Distributed Lag, MSVAR = Markov-Switching Vector Auto regressions.

As shown in table 3, 50% of the studies used the OLS estimation technique with the rest of the studies using different methodologies. All of the studies above assert that there is a relationship between inflation, interest rate and economic growth with Vermeulen (2015) showing a negative relationship between inflation and output.

From the reviewed studies, it can be concluded that developed countries show a positive relationship between inflation and economic growth with the developing countries showing a negative relationship. This inconsistency entices the need to examine the relationship between inflation rate, interest rate and economic growth in the SACU region. To the best of our knowledge there are few studies done to investigate the relationship between economic growth, inflation and interest rate in SACU region.

3. Data Sources and Methodology

3.1 Data Sources

The data for SACU countries is obtained for a period between 1991-2018. Interest rate used shows the bank rate that usually meets the short- and medium-term financing needs of the private sector. The data sources are shown in table 4 below.

Table 4: Data sources and measurement of variables

Variable	Measurement	Source
Inflation	Consumer Price Index (CPI)	United Nations Conference on Trade and Development
Economic Growth	Gross Domestic Product growth	United Nations Conference on Trade and Development
Interest rate	Bank rate	World Bank Development Indicators

3.2 Methodology

The study uses a log-log model and the functional form shown below:

$$\begin{aligned} \text{Log } \Delta \text{GDP}_{it} &= \beta_1 + \beta_2 \text{Log } \Delta \text{CPI}_{it} + \beta_3 \text{Log } \Delta I_{it} + \mu_{it} \quad i = 1, 2, \dots, N, t \\ &= 1, 2, \dots, T. \end{aligned} \quad (1)$$

Where ΔGDP is changes in Gross domestic product for country i in period t , ΔCPI is the changes in Consumer Price Index, which shows inflation rate for country i in period t , ΔI is the changes in interest rate for country i in period t , i is the individual country and t is time

period. The estimation method used in this study is the Panel ARDL model, FMOL and the DOLS. According to Nkoro and Uko (2016), these PMG models allows for heterogeneity only in the short-run compared to the mean group which allows for heterogeneity both in the short and the long-run. Besides the short-run and long-run effects that are captured among the variables in the model, the PMG additionally investigates the dynamic effects of the independent variables on the dependent variable. The general form of the PMG can be shown by the following equation:

$$GDP_{it} = \sum_{j=1}^p \lambda_{ij} \Delta gdp_{i,t-j} + \sum_{j=0}^q \delta_{ij} \Delta CPI_{i,t-j} + \sum_{j=0}^q \delta_{ij} \Delta I_{i,t-j} + \mu_t + \epsilon_{it} \quad (2)$$

The following notation for equation (8):

i number of panels countries with $i = 1, 2, \dots \dots \dots 5$

t = time period with $t = 1, 2, \dots \dots \dots 12$

λ_{ij} = is a scalar

μ_t = is a group specific effect.

The error correction equation is derived from equation (2):

$$\Delta GDP_{i,t} = \phi_i (GDP_{i,t-1} - \beta_{1i} - \beta_{2i} lCPI_{i,t} - \beta_{3i} lI_{i,t}) + \sum_{j=1}^{p-1} \lambda_{i,j}^* \Delta GDP_{i,t-j} + \sum_{j=0}^{q-1} \delta_{1i,j}^* \Delta CPI_{i,t-j} + \sum_{j=0}^{q-1} \delta_{2i,j}^* \Delta I_{i,t-j} + u_{it} \quad (3)$$

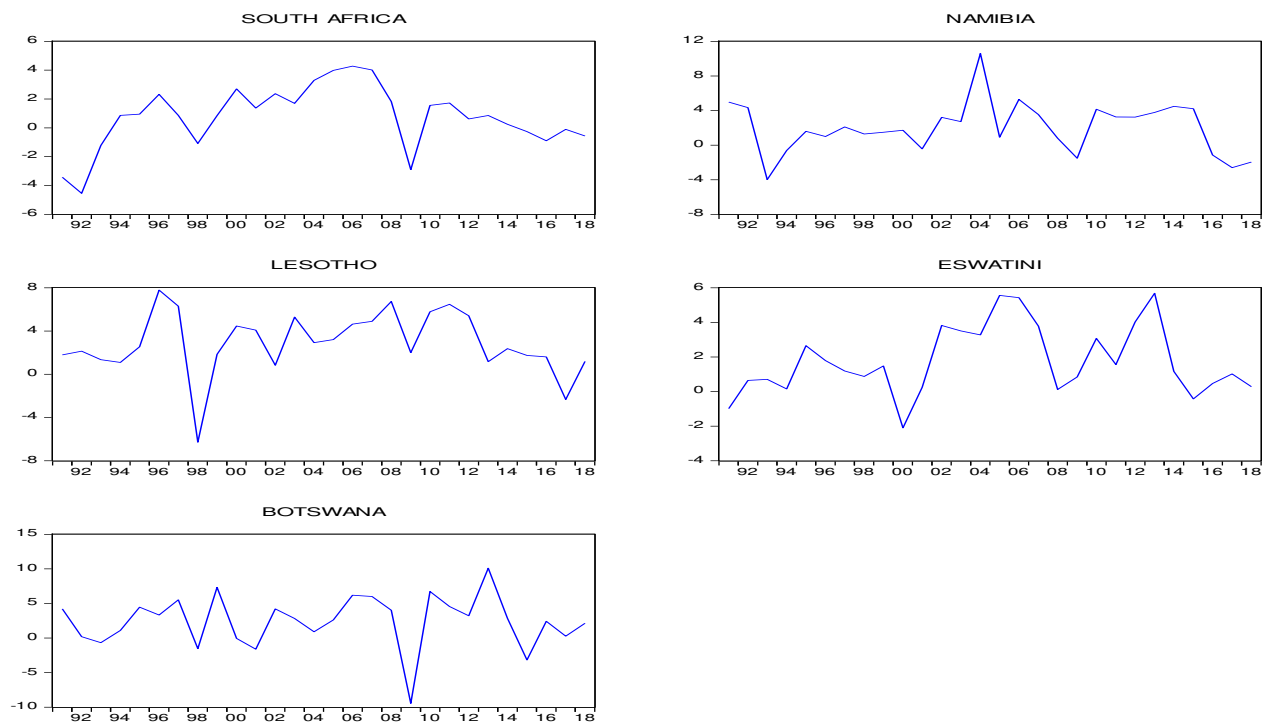
With Δ indicating first difference operator, $\lambda_{i,j}^* = -\sum_{m=j+1}^p \lambda_{i,m}$, $\delta_{i,j}^* = -\sum_{m=j+1}^q \delta_{i,m}$, and $\phi_i = -(1 - \sum_{j=1}^p \lambda_{i,j})$ is the error correction term which measures the speed of adjustment back to the steady state equilibrium subsequent to a shock to the system and the parameter is expected to be negative and significant. If the speed of adjustment is statistically not different from zero, then no long-run relationship exist.

4. Empirical Analysis and Results

4.1 SACU Countries Comparative Analysis for the period 1991-2018

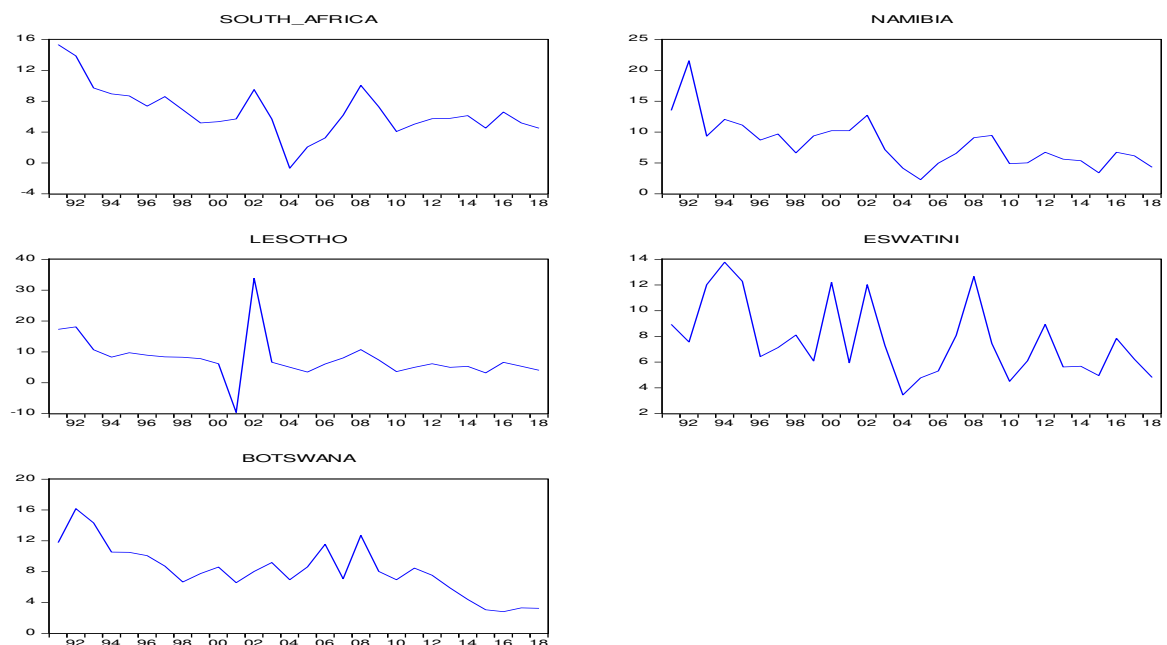
The movements of economic growth, inflation and interest rate are shown in figure 2, figure 3 and figure 4 below, respectively.

Figure 2: GDP growth rate for countries in the SACU region



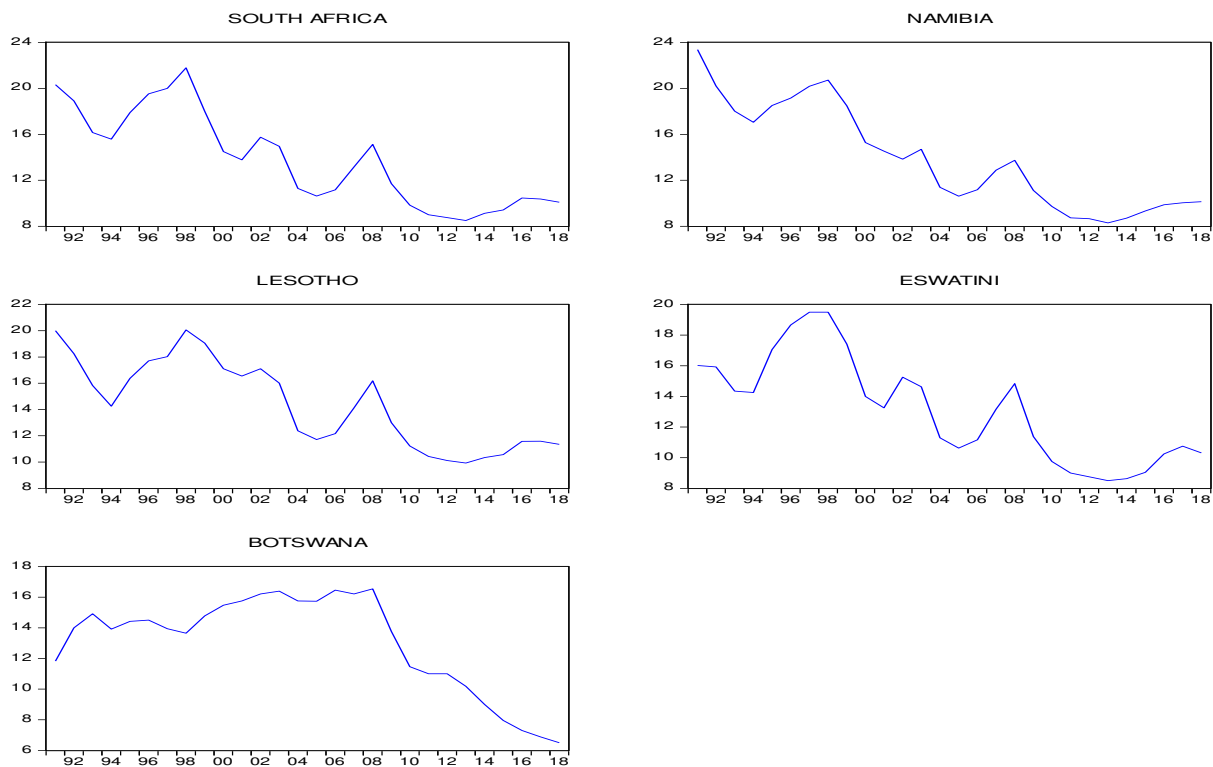
Source: Author's calculation from Eviews 9.2 using data from United Nations Conference on Trade and Development data (2020).

Figure 3: Inflation rates of countries in the SACU region



Source: Author's calculation from Eviews 9.2 using data from United Nations Conference on Trade and Development data (2020).

Figure 4: Interest rates of countries in the SACU region



Source: Author's calculation from Eviews 9.2 using data from World Bank (2020)

While economic growth shows a positive fluctuating trend for South Africa and Eswatini and no specific trend for other countries over the study period, inflation shows a downward fluctuating trend for all the five countries. In addition, interest rates have been falling on average for all the countries over the study period.

4.2 The Panel Results

The relationship between inflation, lending rates and economic growth is examined using the Panel ARDL model, FMOL and the DOLS to enable isolating short and long run effects. The FMOL and DOLS takes care of small sample bias and endogeneity bias.

4.2.1 The Panel Unit root test

The study uses the common root (Levin, Lin, & Chu) and individual root (Lm, Pesaran and Shin). The summary of the SACU panel unit root tests is shown in the table below.

Table 5: Summary of Panel Unit root test

Variable	Levin, Lin, & Ch		Lm, Pesaran and Shin W-sta	
	<i>Level</i>	<i>1st Difference</i>	<i>Levels</i>	<i>1st Difference</i>

	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend
LGDP	-0.01 (0.49)	-0.73 (0.23)	-6.77 (0.00)***	-5.55 (0.00)***	2.11 (0.98)	-0.98 (0.16)	-5.52 (0.00)***	-3.95 (0.00)***
LCPI	-4.55 (0.00)***	0.37 (0.64)	-2.52 (0.00)***	-2.47 (0.00)***	-1.33 (0.09)	1.09 (0.86)	-3.62 (0.00)	-3.74 (0.00)***
Li	0.25 (0.59)	-0.45 (0.32)	-7.96 (0.00)***	-7.42 (0.00)***	0.75 (0.77)	-2.29 (0.01)***	-6.67 (0.00)***	-5.91 (0.00)***

Note: *, **, *** indicate significance at 10%, 5%, 1% level.

Source: Author's calculation from Eviews 9.

The above table shows that the GDP is integrated in order 1 whilst the CPI and the lending rates is stationary in levels. Since GDP is **I (1)** while CPI and the lending rates are **I (0)** and none is **I (2)**, we can develop a panel ARDL model.

4.2.3 Panel ARDL Results for SACU Members

In table 6, the panel cointegration test was performed using Pedroni and Kao cointegration test. In the Pedroni Cointegration Test, Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic and Panel ADF-Statistic were used while for Kao cointegration test, we used the ADF t-statistic test. A summary of all these results are shown in the table below. Table 7 and Table 8 shows the short run and long results from our analysis, respectively.

Table 6: Panel Cointegration test results

Pedroni Residual Cointegration Test				Kao Residual Cointegration Test		
Panel v_Statistic	Panel rho_Statistic	Panel PP_Statistic	Panel ADF_Statistic	Residual variance	HAC variance	ADF
0.53 (0.29)	0.03 (0.51)	-0.37 (0.35)	-1.30 (0.09)*	0.01	0.01	-3.69 (0.01)***

Note: Numbers in parentheses next to coefficient estimates is the probability, ***, **, * indicate significance at the 1%, 5% and 10% levels.

Table 7: Summary of short run results

CPI	CPI_{t-1}	i	i_{t-1}	COINTEQ
-0.25 (0.65)	1.31 (0.00)***	0.11 (0.27)	-0.13 (0.21)	-0.40 (0.00)***

Note: Numbers in parentheses next to coefficient estimates is the probability. ***, **, * indicate significance at the 1%, 5% and 10% levels.

Table 8: Summary of Long run Estimates of the Panel ARDL, FMOLS and DOLS

Independent Variable	Panel ARDL	FMOLS	DOLS
----------------------	------------	-------	------

CPI	0.90 (0.00)***	0.63 (0.00)***	0.57 (0.00)***
I	-0.22 (0.1)***	-0.51 (0.00)***	-0.66 (0.01)***

Note: Numbers in parentheses next to coefficient estimates is the probability. ***, **, * indicate significance at the 1%, 5% and 10% levels.

The Panel ARDL results shows that changes in CPI values has a positive effect on changes in GDP in the long run whereas changes in lending rates has negative effect on changes in GDP values in the long run. The Panel ARDL shows that CPI and lending rates have no impact on GDP in the short run. These results shows that in the long run, when SACU CPI increases by 1%, on average, the SACU's GDP increases by 0.90%. In contrast, an increase in SACU lending rates by 1% lead to a decline in SACU GDP by 0.22% on average, in the long run.

Although, the Panel ARDL is used to guide in the conclusion, the FMOLS and the DOLS results also shows a significant positive relationship between CPI and GDP while no relationship between lending rates and the GDP is found in SACU. According to the FMOLS, an increase in the CPI by 1% increases the GDP by 0.63 on average. The DOLS results shows that if the CPI increases by 1%, the GDP increases by 0.57%, on average.

The positive relationship between inflation and economic growth is in line with the economic theories. Blanchard and Kiyotaki (1987) believes that the positive relationship can be due to agreements by some firms to supply goods at a later date at an agreed price. Therefore, even if the prices of goods in the economy have increased, output would not decline, as the producer has to fulfil the demand of the consumer with whom the agreement was made. The aggregate supply-aggregate demand (AS-AD) framework also postulates a positive relationship between inflation and growth whereas growth increases, so does the inflation. This evidence is also available in SACU countries where for the past two to three years, inflation has been low and economic growth as well was very low, showing a positive relationship. The works of Stawska (2016), Sattarov (2011) and Pradhan *et al*, (2015) also shows a positive relationship between economic growth and inflation. The findings shows that an increase in the inflation rate may results in an increase in the economic growth of the SACU countries. These results shows that any inflationary trend in the SACU region has a positive a positive impact to the growth of their economies.

5. Conclusion and Policy Implications

The objective of this study was to examine the short-run and long-run relationship between inflation, interest rate and economic growth in the SACU region over the period 1991-2018. Some variables were found to be stationary while others were found to be integrated of order one, hence the panel ARDL model and co-integrating regressions (FMOLS and DOLS) were used to examine this relationship. The results of the Panel ARDL shows that inflation has a positive impact on growth only in the long run while lending rate has a negative impact on growth only in the long run. The FMOLS and DOLS results also show a positive relationship between inflation and economic growth and no relationship between lending rate and GDP is found in SACU region. Despite having some slight differences in terms of the findings, the models agree that inflation has a positive impact on economic growth while interest rate has no impact on economic growth.

These findings provide some important policy implications. The analysis shows that it is desirable to keep inflation high, *ceteris paribus*, and therefore Central Bank should implement those policies that promote inflation maintained at a higher desirable level so as to achieve robust economic growth. Since lending rate is found to have no impact on economic growth in the SACU region, the interest rate can be increased or decreased to manipulate inflation to achieve growth. However, it should be noted that inflation is desirable for growth up to a certain level, where beyond that level, higher inflation is harmful to growth and this level of inflation was beyond the scope of this study. Thus, while inflation targeting brings sanity within the financial sector, this might retards growth as the desirable inflation level would be beyond the targeted inflation level.

Reference

Akume, D., Mukete, E.M. and Njimanted, F.G., 2016. The Impact of Key Monetary Variables on the Economic Growth of the CEMAC Zone. *Expert Journal of Economics*, 4(2).

Ayres, K., Belasen, A.R. and Kutan, A.M., 2014. Does inflation targeting lower inflation and spur growth?. *Journal of Policy Modeling*, 36(2), pp.373-388.

Bonga-Bonga, L. and Simo-Kengne, B.D., 2018. Inflation and Output Growth Dynamics in South Africa: Evidence from the Markov Switching Vector Autoregressive Model. *Journal of African Business*, 19(1), pp.143-154.

Blanchard, O.J. and Kiyotaki, N., 1987. Monopolistic competition and the effects of aggregate demand. *The American Economic Review*, pp.647-666.

Chipote, P. and Makhetha-Kosi, P., 2014. Impact of monetary policy on economic growth: a case study of South Africa. *Mediterranean Journal of Social Sciences*, 5(15), p.76.

Chirwa, T.G. and Odhiambo, N.M., 2017. Sources of economic growth in Zambia: An empirical investigation. *Global Business Review*, 18(2), pp.275-290.

Denbel, F.S., Ayen, Y.W. and Regasa, T.A., 2016. The relationship between inflation, money supply and economic growth in Ethiopia: Co integration and Causality Analysis. *International Journal of Scientific and Research Publications*, 6(1), pp.556-565.

Dornbusch, R. S., Fischer, S. & Kearney, C. 1996. Macroeconomics. Sydney: The McGraw-Hill Companies, Inc.

Eggoh, J.C. and Khan, M., 2014. On the nonlinear relationship between inflation and economic growth. *Research in Economics*, 68(2), pp.133-143.

Friedman, M., 1961. The lag in effect of monetary policy. *Journal of Political Economy*, 69(5), pp.447-466.

Geetha, C., Mohidin, R., Chandran, V.V. and Chong, V., 2011. The relationship between inflation and stock market: Evidence from Malaysia, United States and China. *International journal of economics and management sciences*, 1(2), pp.1-16.

Gokal, V. and S. Hanif 2004. Relationship between Inflation and Economic Growth, Economics Department, Reserve Bank of Fiji, Suva, Fiji, Working Paper 2004/04

Harswari, M.H.A.B.N and Hamza, S.M. 2017. The impact of interest rate on economic development: A study on asian countries. *International Journal of Accounting & Business Management*, vol 5, no. 1, pp.180-188.

Hasanov, M. and Omay, T., 2011. The relationship between inflation, output growth, and their uncertainties: Evidence from selected CEE countries. *Emerging Markets Finance and Trade*, 47(sup3), pp.5-20.

Havi, E.D.K. and Enu, P., 2014. The effect of fiscal policy and monetary policy on Ghana's economic growth: which policy is more potent. *International Journal of Empirical Finance*, 3(2), pp.61-75.

- Holston, K., Laubach, T. and Williams, J.C., 2017. Measuring the natural rate of interest: International trends and determinants. *Journal of International Economics*, 108, pp.S59-S75.
- Imleesh, R.M., Yanto, H. and Prajanti, S.D.W., 2017. The impact of macroeconomic indicators on economic growth in Indonesia, Malaysia and Singapore. *Journal of Economic Education*, 6(1), pp.19-28.
- Kasidi, F. and Mwakanemela, K., 2013. Impact of inflation on economic growth: A case study of Tanzania.
- Karahan, Ö. and Yılgör, M., 2017. The Causal Relationship between Inflation and Interest Rate in Turkey. *European Financial Systems*, 2017, p.309.
- Keynes, J.M., 1936. The general theory of interest, employment and money. *The Economic Journal*, 46(182), pp.238-253.
- Kurihara, Y., 2013. Does adoption of inflation targeting reduce exchange rate volatility and enhance economic growth. *Journal of world economic research*, 2(6), pp.104-109.
- Mavikela, N., Mhaka, S. and Phiri, A., 2019. The inflation-growth relationship in SSA inflation-targeting countries. *Studia Universitatis Babeş-Bolyai Oeconomica*, 64(2), pp.84-102.
- Mothuti, G. and Phiri, A., 2018. Inflation-growth nexus in Botswana: Can lower inflation really spur growth in the country?. *Global Economy Journal*, 18(4), p.20180045.
- Njimanted, F.G., Akume, D. and Mukete, E.M., 2016. The impact of key monetary variables on the economic growth of the CEMAC Zone. *Expert Journal of Economics*, 4(2), pp.54-67.
- Olowofeso, E.O., Adeleke, A.O. and Udoji, A.O., 2015. Impact of private sector credit on economic growth in Nigeria. *CBN Journal of Applied Statistics*, 6(2), pp.81-101.
- Phiri, A., 2012. Threshold effects and inflation persistence in South Africa. *Journal of Financial Economic Policy*, 4(3), pp.247-269.
- Pradhan, R.P., Arvin, M.B. and Bahmani, S., 2015. Causal nexus between economic growth, inflation, and stock market development: The case of OECD countries. *Global Finance Journal*, 27, pp.98-111.
- Salami, F.K., 2018. Effect of interest rate on economic growth: Swaziland as a case study. *J. Bus. Fin. Aff*, 7(3), pp.1-5.

- Sattarov, K. (2011). Inflation and Economic Growth. Analyzing the Threshold Level of Inflation.: Case Study of Finland, 1980-2010. Master Thesis, 15 ECTS. Universitet UMEA.
- Seleteng, M., Bittencourt, M. and Van Eyden, R., 2013. Non-linearities in inflation–growth nexus in the SADC region: A panel smooth transition regression approach. *Economic Modelling*, 30, pp.149-156.
- Sindano, A.N., 2014. *Inflation and economic growth: an estimate of an optimal level of inflation in Namibia* (Doctoral dissertation).
- Southern African Customs Union (SACU)., 2017. Implementing a Common Agenda towards Regional Integration in Southern Africa. Annual Report.
- Southern African Customs Union, 2018. Annual Report.
- Stawska, J., Central bank interest rates, inflation and economic growth in light of inflation targeting strategy in Poland.
- Taylor, J.B., 1993, December. Discretion versus policy rules in practice. In *Carnegie-Rochester conference series on public policy* (Vol. 39, pp. 195-214). North-Holland.
- Thamae, R.I. and Mohapi, M.J., 2014. Modelling inflation in Lesotho: a cointegration analysis. *African Journal of Business and Economic Research*, 9(2_3), pp.117-132.
- Thanh, S.D., 2015. Threshold effects of inflation on growth in the ASEAN-5 countries: A Panel Smooth Transition Regression approach. *Journal of Economics, Finance and Administrative Science*, 20(38), pp.41-48.
- Vermeulen, C., 2015. Inflation, growth and employment in South Africa: Trends and trade-offs. *Economic Research Southern Africa (ERSA) Working Paper*, 547.
- World Bank Group. 2018. Macro Poverty Outlook: Country by Country Analysis and Projections for Developing World. Southern African Customs Union.
- Yüksel, S. and Adalı, Z., 2017. Determining influencing factors of unemployment in Turkey with MARS method.