Effect of Monetary Policy on Unemployment in South Africa: An Econometric Approach

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Abstract

In 2021, South Africa recorded an unemployment rate of 32.6% and in the fourth quarter of the same year, the official unemployment rate hit a high record of 35.3%, the highest since 2008 when Statistics South Africa started the Quarterly Labour force survey. In South Africa, unemployment has been consistently high and rising for the past two decades. Different policies have been put in place over the years to reduce unemployment; however, they have seen little success. This paper investigates how each monetary policy tool influences the level of unemployment in South Africa. It uses an Autoregressive Distributed Lag model to examine for a long-run relationship amongst the variables from the years 1980 to 2020. The findings indicate that the monetary policy used tools influence unemployment in South Africa. Based on results, the South African Reserve Bank should increase money supply and decrease the real interest rate, particularly the prime rate, in order to create employment, though this is not its constitutional obligation. The depreciating exchange rate also shows signs of decreasing unemployment in the short-run and long-run. The paper concludes that as much the South African Reserve Bank is mandated to the keep inflation rate between 3% and 6%, it should not only use interest rate as the only tool to achieve its inflation target goal. This is because when the country is facing cost push inflation; thus, interest rate could not be the best tool to deal with it especially when the country is also facing stagflation situation.

Keywords: Unemployment, Monetary policy, Autoregressive Distributed Lag model, Money supply, Inflation, Interest rates.

Introduction and Stylised Facts

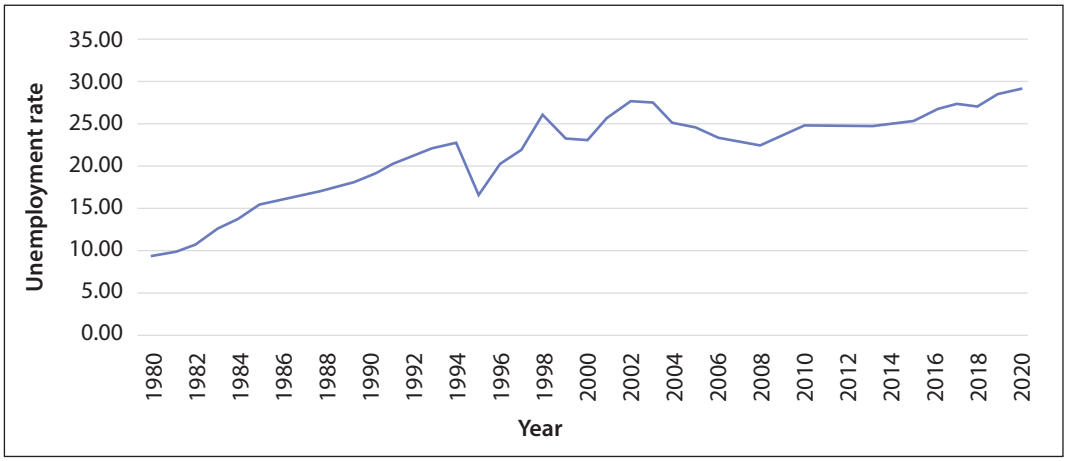
Globally, unemployment is a concerning issue that hampers economic growth and affects the livelihood of individuals in society. Higher welfare payments by the government and government revenue loss are some of the results of high unemployment rate that compel for intervention. In 2021, South Africa recorded an unemployment rate of 32.6% and in the fourth quarter of the same

year, the official unemployment rate hit a high record of 35.3%, the highest since 2008 when Statistics South Africa started the Quarterly Labour force Survey (Stats SA, 2022; Stats SA, 2021). This can be partially explained by the Covid-19 pandemic causing job loss. South Africa, which has always had high unemployment, has consistently faced a high unemployment rate for the past two decades.

The unemployment rate has never fallen below 21.5% in the last 20 years and has mainly fluctuated between 23% and 30% except for 2020, 2021 and 2022, where the official unemployment rate was above 30% (Stats SA, 2022). Youth unemployment was recorded at 46.3% in the first quarter of 2021 (Statistics South Africa, 2021). Nearly half of the youth between the ages 15 and 34 being unemployed is a worrying percentage. The consistent high unemployment rate leads to various issues that hinder economic development and explain stagnant economic growth facing the country, as illustrated in Figure 1 below.

It is important to understand what have been causing the consistent high rate of unemployment experienced by the country. The first potential cause of unemployment is the legacy of education and training that apartheid has left behind (Government Communication and Information System, 2014). During apartheid, black people were excluded from the quality education that allows for access to highly skilled jobs. Research shows that this has contributed to the higher unemployment rates in more recent times. According to Keynes (1936), unemployment would fall if real wages were reduced in response to the price of goods increasing and money wages remaining the same. The absence of this and the rigidity in money wages would then be a cause for involuntary unemployment. Additional causes that may explain the unemployment rate include the high wage demands backed

FIGURE 1: Unemployment Rate Trend in South Africa



Source: Authors

by trade unions (Blanchard, 2017). This constrains opportunities for job creation as companies find it difficult to afford high labour costs and which leads to unemployment. Entrepreneurial intentions that also promote job creation are still low in South Africa. Entrepreneurial activities amongst the youth remain at a low level of 6% of the total youth in the country (Government Communication and Information System, 2014). South Africa's entrepreneurial activity is improving compared to the past years and in 2022 it is estimated to be at 20%; however, it still lags compared to 40% entrepreneurial intentions recorded in Africa (Bowmaker-Falconer & Meyer, 2022). Inflation, exchange volatility and the output gap were found as factors showing significant variations in unemployment in Iran (Valadkhani, 2003). This justifies these factors being considered as additional causes of unemployment due to the significance of their impact on unemployment.

Unemployment is a major concern and almost a worldwide trend causing a sluggish world economy and high budget debt. For example, in response to Corona Virus Crisis (CVC), the United States government made allowances for higher unemployment benefits and food assistance (Statista, 2023). While these payments were increasing, the same level of tax could not be collected as before, which compelled the government to borrow money. High unemployment also creates indirect issues such as the fact that governments cannot collect taxes from unemployed individuals and businesses will have to pay more taxes to cater for this gap (Internal Revenue Service, 2020). High corporate tax discourages companies from hiring more workers as increased operating expenses constrain the production capacity of a firm and therefore make it too expensive to hire new workers. This exacerbates the unemployment that is already associated with the lessened demand for goods and services. Socially, calls from unemployed citizens will be made for stronger restrictions on immigration and by doing this the trading countries may retaliate and reduce trade with South Africa, which will harm the economy. Governments and other relevant policy-makers step in to pave the way for job creation using expansionary fiscal policy and expansionary monetary policy. Fiscal stimulus is used by the government in attempts to boost aggregate spending and therefore increase gross domestic product (GDP). While it can be expected that expansionary fiscal policy would lead to economic growth and therefore reduce unemployment, Murwirapachena, Choga, Maredza and Mavetera's (2013) findings revealed that government expenditure had a positive relationship with unemployment in South Africa. Despite increasing government spending, the unemployment rate remains at high levels. With regards to monetary policy, to stimulate economic activity, the South African Reserve Bank uses a stimulating monetary policy with the expectation of alleviating unemployment.

The monetary policy is the management of money supply by central banks to achieve the intended goals. Monetary policy entails the deliberate steps of the monetary authority to affect the money supply, availability of credit, and interest rates to influence monetary demand, expenditure, production, income, the inflation rate, the exchange rate and the balance of payments (Fourie & Burger, 2019). Since 2000, the SARB has

interpreted its mission as signifying that inflation (internal value of the currency) is the primary objective of monetary policy. The SARB's inflation target interval has remained at 3% to 6% since 2002 (SARB, 2020). For operational reasons, in 1997 the SARB stopped targeting the money supply and adopted an interest rate as an intermediate monetary variable to achieve the inflation target interval (Fourie & Burger, 2019). Monetary policy and unemployment rather than fiscal policy is the focus of this article.

The Constitution of the Republic of South Africa, 1996 states in Chapter 13, section 224(1) that the South African Reserve Bank (SARB) has as objective the protection of the value of the currency in the interest of sustainable economic growth. According to the South African Reserve Bank governor, Lesetja Kganyago as cited by *TimesLive* (2017), the addition of unemployment to their mandate may damage the banks' credibility. While it may not be the bank's intention, some of its tools will have an effect on unemployment. SARB allocates less explicit weight to variables such as production, income, employment, and the exchange rate, and is convinced that SA will not have sustainable long-term economic growth at the desired rate if it does not contain inflation. As a result of achieving a sustainable economic growth, it should be expected that unemployment will decline. For example, monetary policy steps taken using interest rate as SARB's intermediate policy variable affects the country's business activities (investment), and consequently employment.

The monetary policy may not be directly targeted at reducing unemployment, although the tools used to maintain financial stability may have effects on unemployment. Analysing and understanding the effects of monetary policy tools on unemployment could be an indirect method of unemployment control. In other words, the SARB could use these tools, keeping in mind their impact on unemployment in the country. Hence, the primary objective of this paper is to analyse the use of an econometric method, the monetary policy effects on unemployment in South Africa. This is done by firstly identifying different theories who address the use of monetary policy to address unemployment; secondly, by determining which monetary policy tools influence the level of the unemployment rate in South Africa; thirdly, by empirically analysing the relationship between monetary policy tools and unemployment in South Africa in the short-run and long-run and lastly ,by finding the answer to the question of whether the monetary policy of the central bank has a significant effect on unemployment.

Some Previous Empirical Studies

Sunday, Manya, Arigo, Bassey, Ogunyinka, Ojegwo and Ogbuchi (2016) investigate whether there is a dynamic relationship between monetary policy and unemployment in Nigeria. Their study made use of the vector autoregressive (VAR) model to explain the dynamic behaviour of financial time series (Sunday *et al.*, 2016). The study findings indicate evidence of a bidirectional causality relationship between unemployment and monetary policy. Sunday *et al.* (2016) also state that unemployment was affected by the monetary policy through the Keynesian interest rate channel, confirming the presence of the Keynesian hypothesis. Basically, the Central Bank in Nigeria affects the money

market interest rates that are also used by the banks in the country when dealing with customers. By doing this, the decisions made by the households and firms regarding saving and investment will influence and affect the demand for local goods and services. Consequently, labour market conditions will become tighter due to the changes in aggregate demand (Sunday *et al.*, 2016). Not only is Sunday *et al.'s* (2016) study in line with the aforementioned Keynesian theory, it also corroborates that of Brash (1994), which states that the best way the monetary policy can contribute to employment is to focus on maintaining stability in general price levels by focusing on the adjustment of the interest rates within the monetary policy.

To the contrary, a study conducted by Wen (2011) yielded interesting results that are consistent with monetarists' hypothesis. The study sought to analyse the effects of an increased monetary base on unemployment in both the short-run and long-run. The results reveal that there was nearly no impact on unemployment when there was a continued increase in the monetary base by 1% in the short-run, however, unemployment increased significantly in the long run (Wen, 2011). The continuous increase in a monetary base was found to be inflationary, which in turn is counter-productive, by increasing unemployment rather than decreasing it in the long run. This finding supports Hayek's theory that by trying to combat unemployment with either a monetary base or money supply, inflation will become higher, which will eventually increase unemployment. Similar findings were obtained by Attamah, Anthony and Ukpere (2015) when investigating the impact of both fiscal and monetary policies on unemployment in Nigeria from 1980 to 2013 using the changes in interest rate, Money Supply (*M2*) and exchange rates as a proxy of monetary policy. The study concludes with the findings that the money supply has a positive and significant impact on unemployment. These findings are also in line with a study by Anderson, Gascon and Liu (2010). Most monetarists caution that inflation may arise from increases in the money supply. Attamah, Anthony and Ukpere (2015) found a positive effect of the exchange rate on unemployment, implying that the appreciation of the Nigerian currency worsens unemployment. This makes sense since the appreciation of a currency encourages imports (Fourie & Burger, 2019). Imports are a leakage from the aggregate spending and therefore reduce GDP.

However, some studies found that a depreciation of the currency causes unemployment (Bokan, Grgurić, Krznar & Lang, 2009). Typically, a currency depreciation simulates exports by reducing the export price and therefore it is expected to boost GDP and employment as a result (Fourie & Burger, 2019; Benazic & Rami, 2016). Implement of a counter-cyclical monetary policy was found to be very challenging while attempting to maintain the stability of the exchange rate (Anthony & Ukpere Bokan *et al.*, 2009). Benazic and Rami (2016) also found money supply to have an insignificant effect on unemployment both in the short- and long-run in Croatia. The interest rate was found to have an insignificant positive relationship on unemployment (Benazic & Rami, 2016). Attamah, Anthony and Ukpere (2015) found that an increase in prices will lead to an increase in unemployment in the long run while in the short-run, the effect is insignificant. Contrarily, in the Republic of Serbia,

Veselinovic (2020) found inflation to have a significant impact on the unemployment rate, importantly monetary policy was found to have an insignificant relationship with unemployment in the long run. However, in the short-run interest rate has a positive relationship with the unemployment rate.

The relationship between the unemployment rate and the monetary policy is also studied in Sweden by Alexius and Holmlund (2007) and the study found that shocks to the monetary policy were responsible for 22%-35% of the fluctuations that occur in unemployment and with 30% of these effects remaining for a decade. Many more studies conducted analyses of the effects of monetary policy, inflation and exchange rate on unemployment in different countries, providing different findings (Schettkat & Sun, 2008; Stiglitz, 1997; Camargo & Cortez, 2011; Ekwe, 2018). The empirical literature provided evidence of the monetary policy having an effect in some countries and not much in other countries. South Africa is one of the countries that have the highest unemployment rate, and it is important to investigate the impact monetary policy may have on unemployment.

Data and Research Methods

Data Sources

The study seeks to investigate monetary policy effects on unemployment in South Africa using annual data covering the period from 1980 to 2020. The model used includes the unemployment rate as the dependant variable while money supply M3, is the interest rate, and the exchange rate and population growth are independent variables. Data used was collected from different sources. Data for the unemployment rate is accessed from the International Monetary Fund (IMF), Money supply M3 and exchange rate data is sourced from the South African Reserve Bank, while data for interest rate and population growth is collected from the World Bank database. Different to the empirical literature review, the current study includes population growth as an explanatory variable, keeping in mind that population growth probably has an influence on unemployment to a certain extent in the South African context.

Model Specification and the Discussion of Variables

The following are the mathematical form and econometric the model used to examine the impact of the monetary policy effects on unemployment in South Africa.

Mathematical formulation:

$$U_t = f(\overset{-}{lnM3_t}, \overset{+}{I_t}, \overset{+}{P_t}, \overset{-}{ER_t})$$

Econometric model:

$$U_t = \beta_0 + \beta_1 lnM3_t + \beta_2 I_t + \beta_3 P_t + \beta_4 ER_t + \varepsilon_t$$

In the model above, *U* denotes the unemployment rate and it is measured according to the South African official unemployment rate definition. Monetary policy is mainly represented by three independent variables. The first is lnM_3 which stands for the log of money supply in South Africa, and is expected to have a negative relationship with the unemployment rate (Alhamdany & Obaid, 2020) where a decreased real money supply discourages economic activity. The second variable is *I* which represents the real interest rate or prime rate set by the central bank and it is expected to have a positive

sign (Attamah, Anthony & Ukpere, 2015; Veselinovic, 2020). The real interest rate has an inverse relationship with real investment. Investment is a component of aggregate expenditure and therefore affects GDP and employment (Fourie & Burger, 2019). A lower interest rate encourages real investment and as a result aggregate expenditure, and employment improve. Thirdly, *ER* represents the exchange rate of the rand in comparison to other countries and the expected sign is positive (Attamah, Anthony & Ukpere, 2015; Ekwe, 2018). The exchange rate is the price of a currency in terms of another currency. A currency depreciation simulates exports by reducing the export price and therefore it is expected to boost GDP and employment as a result (Fourie & Burger, 2019; Benazic & Rami, 2016). *P* stands for population growth in the country and is expected to have a positive relationship with unemployment (Arslan & Zaman, 2014). An increasing population growth rate feeds the labour force pool and a country might not have enough jobs for the increased supply of labour, especially when the population growth rate is above the economic growth rate.

Unit Root Test

A unit root test is undertaken to determine the level at which the time series are stationary. The presence of unit roots provides evidence of the data being non-stationary. To investigate the stationarity of the variables used, the Augmented Dickey Fuller Test (ADF) is used. The ADF test states as a null hypothesis that there is a unit root for the test and the alternative hypothesis states that the time series is stationary when *P* is equal or below 5% and thus the null hypothesis can be rejected (StatisticsHowTo, 2016). To assess the validity of the model used, the study also performs several diagnostic tests including heteroskedasticity, multicollinearity and normality tests to avoid a biased or ineffective model.

Autoregressive Distributed Lags

The Autoregressive Distributed Lag model (ARDL) requires the selection of sufficient number of lags with the objective of capturing data. Unlike the Johansen cointegration test, the ARDL model does not require all the variables to be integrated at the same order; however, all the variables need to be I(1) (Shresta & Bhatta, 2018). The ARDL can be used when all variables are stationary at level I(0) or at first difference I(1) or even a combination of I(0) and I(1) but should have no variable of I(2) (Pesaran & Shin, 1997) This model is also great for the forecasting of long-run relationships from their short-run dynamics (Kripfganz & Schneider, 2018). The ARDL model that is used to determine the relationship between the monetary policy and the unemployment rate is presented as follows:

$$\Delta U_t = \beta_0 + \sum_{i=1}^{p} \lambda_i \Delta U_{t-i} + \sum_{i=1}^{q1} \delta_{1i} \Delta lnM3_{t-i} + \sum_{i=1}^{q2} \delta_{2i} \Delta I_{t-i} + \sum_{i=1}^{q3} \delta_{3i} \Delta P_{t-i} + \sum_{i=1}^{q4} \delta_{4i} \Delta ER_{t-i} + \varphi_1 U_{t-1} + \varphi_2 lnM3_{t-1} + \varphi_3 I_{t-1} + \varphi_4 P_{t-1} + \varphi_5 ER_{t-1} + \varepsilon_t$$

Where ΔU denotes the change in the unemployment rate at time t in South Africa; $\Delta lnM3$ indicates change in money supply $lnM3$ at time t in South Africa; ΔI represents the change in real interest rate at time t in South Africa; ΔP denotes the change in population growth rate at time t in South Africa and ΔER shows the change in exchange rate at time t in South Africa. β_0 represents the intercept, p and q represent the number of

lags while e_t is the error term. $\delta_{1i}, \delta_{2i}, \delta_{3i}$ and δ_{4i} represent the short-run dynamics of the model. $\varphi_1, \varphi_2, \varphi_3, \varphi_4$ and φ_5 represent the long run coefficients. To determine whether the variables co-integrate in the bounds test, the following hypotheses are set:

- The null hypothesis for co-integration H_0: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$
- The alternative hypothesis for no co-integration is H_1: $\varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq 0$

The bounds test is used to test the aforementioned hypothesis. According to Pesaran, Shin and Smit (2001), the null hypothesis is rejected when the F-statistic is greater than the upper bound critical value from the Pesaran table and this indicates the presence of co-integration. However, a lower bound critical value that is higher than F-statistics results in not rejecting the null hypothesis and confirms the absence of co-integration. The result from this test indicates whether an error correction model should be used. The presence of long-run relationships or co-integration derives the following equation below:

$$\Delta U_t = \beta_0 + \sum_{i=1}^{p} \lambda_i \Delta U_{t-i} + \sum_{i=1}^{q1} \delta_{1i} \Delta lnM3_{t-i} + \sum_{i=1}^{q2} \delta_{2i} \Delta I_{t-i} + \sum_{i=1}^{q3} \delta_{3i} \Delta P_{t-i} + \sum_{i=1}^{q4} \delta_{4i} \Delta ER_{t-i} + \varphi ECT_{t-i} + \varepsilon_{1t}$$

In this equation, ECT_{t-i} is the error correction term and φ is the coefficient which measures the speed of adjustment towards the equilibrium in the long-run.

Results and Discussion

This section presents the findings obtained with regards to the analysis of monetary policy effects on unemployment in South Africa.

Diagnostic Tests Results

Table 1 on the next page presents variance inflation factors that measure multicollinearity while Table 2 depicts the results of other diagnostic tests. Any figures between 1 and 10 indicates little to no severe multicollinearity (Studenmund, 2014). The values of the cantered VIF of the residuals in Table 1 shows that there is no severe multicollinearity in the model.

According to Breusch-Pagan-Godfrey Heteroskedasticity test in Table 2 on the next page, the null hypothesis cannot be rejected since Prob. Chi squared value is greater than 0.05 (Breusch & Pagan, 1979). This implies that the residuals are homoscedastic and therefore their variance is constant. The normality test is tested with the use of the Jarque-Bera test and with reference to Table 2, the residuals are normally distributed with the probability of 0.7307>0.05 level of significance.

Unit Root Test Results

Table 3 on the next page depicts the results of the ADF unit root test for stationarity of each variable.

A unit root test with the Augmented Dickey-Fuller test on the data is conducted to determine whether the data series is stationary at Level *I(0)*, 1st Difference *I(1)* or 2nd Difference *I(2)*. The results indicate that unemployment, money supply and population growth are stationary at first difference *I(1),* while interest rate and exchange rate are stationary at level *I(0)*. These results

imply that the ARDL bounds test for co-integration is appropriate as the variables are stationary at level and 1st difference (Narayan & Smith, 2004).

Table 1: Variance Inflation Factors (Multicollinearity)

Variable	Coefficient Variance	Uncentred VIF	Centred VIF
C	93.81570550491312	894.999599019595	
lnM3	0.2504788522169774	417.8901076924255	5.174073715077499
I	0.007153184715172272	2.34101709931669	1.140730196137816
ER	0.000893135345940989	126.5105723348717	2.615572462316249
P	2.04605075449742	72.23603338874639	5.74143570285559

Source: Authors

Table 2: Other Diagnostic Tests

Test	Null Hypothesis	Probability	Conclusion
Jarque-bera	Residuals are normally distributed	0.7307	accepted null hypothesis
Breusch Pagan-Godfrey	homoskedasticity	0.2584	accepted null hypothesis

Source: Authors

Table 3: Unit Root Test Results

Variables	Level and Difference	P value	Decision
Unemployment (U)	Level (None)	0.9478	*I(1)*
	Level (Intercept)	0.2933	
	Level (trend and intercept)	0.2376	
	1st Difference (None)	0.0000	
Money Supply (lnM3)	Level (None)	0.9896	*I(1)*
	Level (Intercept)	0.1310	
	Level (Trend and intercept)	0.9200	
	1st Difference (None)	0.0129	
Interest Rate (I)	Level (None)	0.0000	*I(0)*
Exchange rate (ER)	Level (None)	0.2830	*I(0)*
	Level (Intercept)	0.0703	
	Level (Trend and intercept)	0.0180	
Population Growth (P)	Level (None)	0.1145	*I(1)*
	Level (Intercept)	0.5561	
	Level (Trend and intercept)	0.3529	
	1st Difference (None)	0.0264	

Source: Authors

Table 4 presents the bounds test results that indicate whether there is a cointegration among the variables and whether an Error correction model for the long-run relationship is required. In this model, the F-statistic of 6.54 is larger than both the *I(0)* and *I(1)* values at 5%, significance levels indicating the existence of cointegration or a long-run relationship. An error correction model is required to assess the speed of adjustment back to equilibrium.

The next step after the unit root test is the selection of lags. Different criterions were used for the process, namely, the sequential modified LR statistic (LR), the final prediction error (FPE), Akaike information criterion (AIC), the Schwarz information criterion and Hannan-Quinn information criterion. The lag selection results indicate the optimal number of lags to be required for the equation. All the selected lags in Table 5 show the chosen number of lags with an asterisk (*). According to the table, the majority of the (LR, FPE, AIC, SC and HQ) criteria selected three lags for the model.

The ARDL model provided the results listed in Table 6 on the next page. The R^2, which measures the strength of the relationship between dependent and independent variables, is very good at 94% with the adjusted R^2 at 90%. This indicates that the independent variables can explain the changes in the dependent variable (U) really well (Studenmund, 2014). The intercept C is seen

TABLE 4: Bounds Tests Results

F-bounds Test		Null Hypothesis: No Levels Relationship		
Test Statistic	*Value*	*Signif.*	*I(0)*	*I(1)*
			Asymptotic: n=1000	
F-statistic	6.540085	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Authors

TABLE 5: Lag Selection Results

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-383.3034	NA	516.8220	20.43702	20.65249	20.51369
1	-155.4052	383.8287	0.012060	9.758167	11.05100	10.21815
2	-87.11655	97.04172	0.001328	7.479818	9.850009	8.323114
3	-22.73368	74.54859*	0.000203*	5.407036*	8.854586*	6.633648*
* Indicates lag order selected by the criterion						

Source: Authors

TABLE 6: ARDL Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
U(-1)	0.134641	0.156918	0.858031	0.3994
lnM3	-0.658942	7.724894	-0.085301	0.9327
lnM3(-1)	-9.768682	13.66447	-0.714897	0.4816
lnM3(-2)	10.73017	8.001423	1.341033	0.1925
I	0.208116	0.119851	1.736460	0.0953*
ER	-0.045492	0.027559	-1.650721	0.1118
ER(-1)	-0.053905	0.039295	-1.371804	0.1828
ER(-2)	0.005118	0.035311	0.144930	0.8860
ER(-3)	-0.070094	0.032320	-2.168780	0.0402**
P	-0.5635285	0.2200637	-2.560752	0.0172**
P(-1)	0.1479114	0.5338903	2.770445	0.0106**
P(-2)	-0.1396479	0.4897056	-2.851672	0.0088***
P(-3)	0.4666580	0.1744705	2.674710	0.0133**
C	37.97368	15.97823	2.376589	0.0258**
R-squared	0.940168			
Adjusted R-squared	0.907759			
*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%.				

Source: Authors

to be significant at 5% and has a positive relationship with unemployment. It can be interpreted as a 1% increase in the intercept, and holding *lnM3*, *I*, *ER* and *P* constant, will lead to a 37.97 increase in *U*. This means unemployment rises on its own when it is not influenced by the monetary policy. Money supply (*lnM3*) is observed to have a negative relationship with unemployment; however, the relationship is not statistically significant as the P-value for the variable lies above 5%. Therefore, the null hypothesis cannot be rejected. In other words, the data for *lnM3* is not sufficient to make a conclusion on unemployment. There were concerns that the sample size was not large enough for the data, which could lead to the risk of not statistically significant findings. Money supply at one time point in the past also presented a negative relationship with unemployment; however, the variable still remained not statistically significant. It is only when money supply is two lags in the past that a positive relationship is observed. The coefficient is still not statistically significant.

The interest rate (*I*) presented a positive relationship with unemployment and is statistically significant lying below the 10% level. This positive relationship is the expected sign as a 1% increase in *I* is followed by a 0.20 increase in unemployment when

all the other variables are held constant. The increase of *I* makes it more difficult for firms and entrepreneurs to receive loans and more capital for their businesses, which increases unemployment as it is harder to employ more people. The relaxation of this interest rate with the positive relationship to unemployment should allow more money to flow in the economy, raising the employment level (Pettinger, 2019; Attamah, Anthony & Ukpere, 2015).

The exchange rate (ER) presents varying results with the addition of each lag. ER without a lag is observed to have a negative relationship with unemployment; however, it is not statistically significant. Therefore, a 1% increase in the exchange rate leads to a 0.045 decrease in unemployment. The result is similar when looking at ER one time point in the past. There is a negative relationship, which is not statistically significant. There is a change when looking at ER two lags in the past. While the coefficient is still not statistically significant, the sign changes, indicating a positive relationship between the exchange rate and unemployment. The exchange rate three lags in the past presents a negative relationship, which is statistically significant with the P-value being less than 0.05.

The population growth rate (P) is observed to have a statistically significant relationship with unemployment as the P-value is less than the 5% level, indicating that the alternative hypothesis may be accepted. The relationship is also negative indicating that a 1 unit change in the population growth rate while holding the other variables constant will lead to a 0.5635 decrease in unemployment. This differs from the expectation of a positive relationship in the study as the assumption is that the increase in population should lead to an increase in unemployment due to an eventual increase in the labour force not being as much as the supply of jobs in the labour market (Nafziger, 2012; Arslan & Zaman, 2014). While it may be difficult to explain the reason for the observed relationship, it could be explained by the increased population increasing the number of entrepreneurs whose innovations increase economic growth and employment according to Schumpeterian theory (Schumpeter, 1939). The *P* one time point in the past meets the expected sign presenting a positive relationship with unemployment while still being statistically significant at 5%. As mentioned above, the labour supply will exceed labour demand with the rise in population resulting in unemployment (Nafziger, 2012; Arslan & Zaman, 2014). P two lags in the past returns to the negative however statistically significant relationship observed in P without a lag at 1%. P three lags in the past presents a positive, statistically significant relationship with unemployment at 5%, once again agreeing with the expected sign of the study.

The levels equation shown in Table 7 on the next page also provides long-run data on the variables. In the long-run, money supply has a positive relationship with unemployment despite not being statistically significant due to a P-value higher than 5%. The interest rate has a positive relationship with unemployment in the long-run; however, the relationship is also not statistically significant. The increase in the interest rate by 1%, holding other variables constant, should result in a 0.24 increase in unemployment in the long-run. This is in line with Keynesian theory where decreases in the interest rates lead to a reduction of

Table 7: Levels Equation

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	**Coefficient**	**Std Error**	**t-Statistic**	**Prob.**
lnM3	0.349621	0.752956	0.464331	0.6466
I	0.240496	0.145648	1.651211	0.1117
ER	-0.189949	0.048562	-3.911427	0.0007
P	-1.645100	1.648313	-0.998050	0.3282
C	43.88197	15.94147	2.752693	0.0111
EC = U–- (0.3496*LNM3 + 0.2405*I -0.1899*ER -1.6451P + 43.8820)				

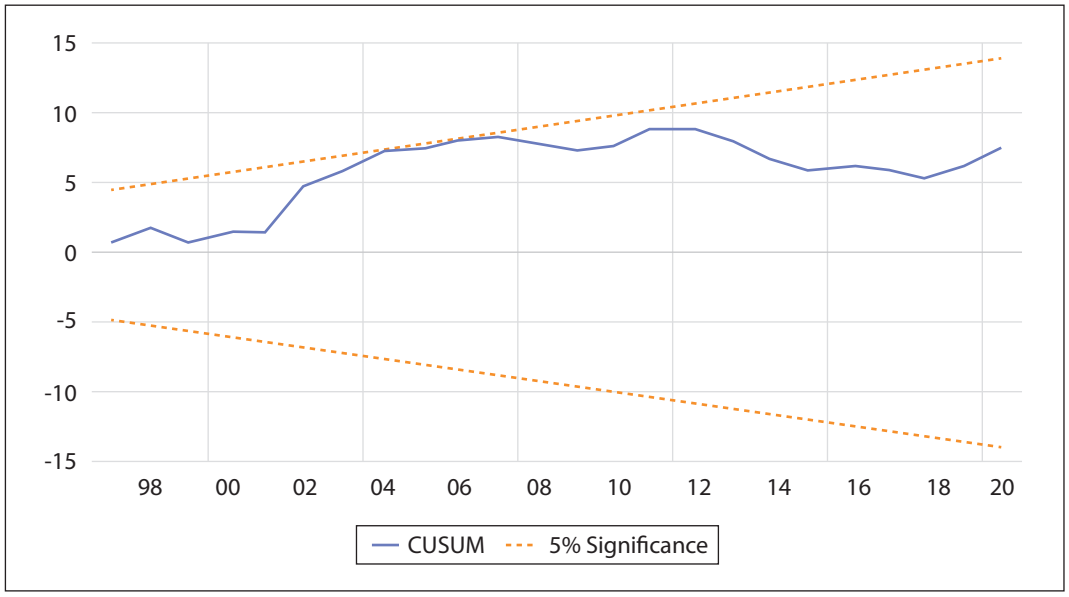
Source: Authors

unemployment in the country (Pettinger, 2019; Attamah, Anthony & Ukpere, 2015). The exchange rate is statistically significant and has a negative relationship with unemployment in the long-run. The increase in the exchange rate by 1 unit, holding all other variables constant, results in a 0.1899 decrease in unemployment in the long-run. The exchange rate depreciating increases exports, bringing money into the country and possibly creating jobs (Benazic & Rami, 2016). Population growth is observed to have a negative relationship with unemployment in the long-run, however, it is not statistically significant. According to Arslan and Zaman (2014), population growth should have a positive relationship with the unemployment rate. Similar to the short-run findings, this relationship is negative instead of positive. The expectation is that an increasing work force would outgrow the number of jobs in the labour market; however, the findings from this data indicate otherwise. Perhaps the new population in the longer term become innovating entrepreneurs creating job opportunities for others. Figure 2 on the next page explains the CUSUM test.

Figure 2 is a CUSUM test that has a target value and plots the cumulative sum of deviations of the sample value from the target value (Wachs, 2010). The data from the ARDL model falls below the upper limit within the 5% significance level with none of the points falling out of the control limits. Table 8 on the next page presents the short-run results accompanied with the long-run included as ECT(-1) after using the ARDL Error Correction model.

The important result from ECM is that the ECT(-1), which represents the coefficient for the error correction term indicating the speed of adjustment (Pesaran, Shin & Smith, 2001; Niyimbanira, 2013) is negative and statistically significant as expected. In other words, in this model, the speed of adjustment is high at almost 87%. The variable coefficient is also highly significant with the required negative sign and a probability of 0.0000 under the 5% level. The R^2 has fallen from the high 94% in the previous ARDL model prior to the bounds test to an average 64% in the short run, which is still at an acceptable level. The independent variables do an average job at explaining the independent variable.

FIGURE 2: CUSUM Test



Source: Authors

TABLE 8: ARDL Error Correction Regression

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	**Coefficient**	**Std Error**	**t-Statistic**	**Probity**
D(lnM3)	-0.658942	5.138322	-0.128241	0.8990
D(lnM3(-1))	-10.73017	5.054692	-2.122814	0.0443**
D(ER)	-0.045492	0.021156	-2.150301	0.0418**
D(ER(-1))	0.064977	0.025260	2.572282	0.0167**
D(ER(-2))	0.070094	0.024022	2.917879	0.0075***
D(P)	-0.5635285	0.1343194	-4.195437	0.0003***
D(P(-1))	0.9298215	0.2277728	4.082233	0.0004***
D(P(-2))	-0.4666580	0.1255904	-3.715713	0.0011***
*ECT(-1)**	-0.865359	0.125671	-6.885900	0.0000
R-squared	0.646004			
Adjusted R-squared	0.548349			
*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%				

Source: Authors

Discussion and Recommendations

The paper introduced research objectives have all been answered and are summarised in this section. The first question attempts to find out whether monetary policy objectives interact with unemployment in South Africa. The South African Reserve Bank prioritises the protection of the South African rand and this is done with the monetary policy and other measures to manage the country's exchange rate. The study reveals that the exchange rate shares a relationship with the unemployment rate, indicating that these two variables interact. However, it is only the exchange rate three lags in the past that is statistically significant in the ARDL model prior to a bounds test. The interaction also presents a negative relationship in the short-run ER without lags and long-run. This could be explained by the depreciation of the exchange rate leading to an increase in exports and potentially bringing more money into the economy, creating more jobs. ER in the short-run one and two time periods in the past presents a positive relationship, which Benazic and Rami (2014) states that the price rises from the exchange rate depreciation may raise unemployment.

The next research question seeks to gain an understanding of what is causing unemployment to be as high as it currently is. There are multiple factors that are seen to be a possible cause. The first factor is the legacy that apartheid left behind in education and training as black people were excluded from having skilled jobs or participating in education. The effects of this are still felt by the country in present times. Keynesian theory can also be partially used to explain why unemployment in the country is as high as it is. The theory states that the absence of rigidity in money wages with the price of goods increasing would also cause unemployment. High wage demands from trade unions are also potentially a cause as companies are not able to meet the demands, which creates unemployed individuals. Entrepreneurial activity in South Africa, which would be beneficial to job creation has also been declining, especially among the youth. One has to look at different theories from the past to try and predict the possible relationship a monetary policy may have on unemployment.

The classical theory partially mentions the relationship; however, importance is placed on government intervention to combat unemployment. Some followers of the classical theory do suggest the use of an expansionary monetary policy, which increases money supply and eventually employment. Keynesian economists, on the other hand, are not fully on board with this idea and prefer the reduction of the interest rates as a subsidiary to the fiscal policy to create employment. Keynesians also prefer combatting unemployment over inflation as the belief is that costs from combatting inflation due to combatting unemployment are small. Economist Hayek disagree with this approach as increasing the money supply leads to high unemployment and inflation. Hayek states that the individuals that gain additional money from Keynesian policies spend it on whatever suits them rather than on the sectors affected the most by unemployment. The increasing expenditure grows large enough to finally reach the sectors in crisis, raising employment. The rise in expenditure to achieve this grew to a point so large that it resulted in high inflation.

Monetarists are of a similar opinion that the increase in money supply grows to a point so large it results in inflation in the long-term.

The next question and objective look at which monetary policy tools influence unemployment. The objective is to estimate the effect it presents and identify which tool has the largest effect. Looking at the first monetary policy tool used in the study, money supply (ln M3) with lags, without lags and in the long-run are observed to not be statistically significant in the ARDL results prior to the bounds test. This indicates the relationship between unemployment and money supply cannot be proven. Money supply one time in the past in the short-run presents a negative statistically significant relationship with unemployment. Possibly the increase in money supply injects more money into the economy, which creates more jobs. The second tool, interest rate (I), did provide evidence of a statistically significant relationship in the ARDL results prior to the bounds test. The relationship with unemployment is also positive, which agrees with Keynesian theory that reduction in the interest rate reduces the unemployment rate. The relaxation of the interest rates could unlock more economic activity and potentially create employment. When looking at the unemployment rate, it is also important to take population growth into consideration.

Population growth (P) is included in the model to see the additional effect of a growing population on the unemployment rate. The expectation is that the population growth rate increasing raises unemployment due to insufficient job opportunities to account for new workers who will eventually enter the economy. The study provides differing results, as a negative statistically significant relationship is observed in population growth without a lag and two lags in the past in the pre-bounds test results. This relationship is also seen in the short-run results for P without a lag and two lags in the past. Possibly, this is the case due to the new population introducing innovators in the workforce whose innovations creates more jobs. It is only in P one lag in the past before the bounds test in the short-run and three periods in the past where the expected positive relationship is observed.

Contribution and Policy Implication

With unemployment continuing to rise in South Africa, alternative measures to attempt to reverse it need to be looked at. Any current measures implemented by the government are not working. This could be a way to alter the South African Reserve Bank's goals to try to combat unemployment as well. This study contributes to the search for alternative measures to combat unemployment by reviewing the possibility of the monetary policy being used as a measure. The goal is to see whether monetary policy tools and objectives have an effect on the unemployment rate, and this provided varying results. This study can add to the motivation for use some of the tools and objectives to combat the rising unemployment rate.

Based on the results from the paper, the monetary policy tools and objectives can be used to combat unemployment. Namely, money supply increases should lead to the reduction of unemployment. The real interest rate, particularly the prime rate, could

be reduced in an attempt to allow more money to flow in the economy, which would reduce unemployment based on the findings of the study. Implementing these policies comes at the risk of inflation rising as stated in monetarist and Hayek theory; however, more jobs would be created. The Central Bank may also allow the exchange rate to depreciate, which should allow jobs to be created in the short-run and long-run, based on the finding of the study. Money supply should not be adjusted with the aim creating employment as the relationship it has with unemployment cannot be proven. Finally, as much the South African Reserve bank is mandated to keep inflation rate between 3% and 6%, it should not use interest rate as the only tool to achieve its goal. This is because sometimes the country has cost push inflation, which is not the best tool to deal with it, especially when the country is facing a stagflation situation.

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