

IS INFLATION IN SOUTH AFRICA A STRUCTURAL OR MONETARY PHENOMENON?

MICHAEL ADUSEI*

DEPARTMENT OF ACCOUNTING AND FINANCE, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI-GHANA,

ABSTRACT

Aim: The aim of the study is to investigate whether or not inflation in South Africa is structural phenomenon or monetary phenomenon.

Study design: Case Study

Place and Duration of Study: South Africa. Time series data ranging from 1965 to 2006.

Methodology: The study employs unit root testing, co-integration analysis, Fully Modified Ordinary Least Squares (FMOLS) regression, Two-Stage Least Squares (2SLS) regression, Error Correction Model and Pairwise Granger Causality Test technique to analyze annual time series data from South Africa.

Results: The findings suggest that in the short run, nominal exchange rate, nominal prime lending rate, inflation in USA, broad money supply and government spending are not likely to influence prices in South Africa. Instead, the paper finds income as a significant determinant of prices in South Africa in the short run. In the long run, whereas nominal exchange rate, inflation in USA, and size of government are positively related to inflation, broad money supply is negatively related to inflation. Granger Causality Tests reveal that there is uni-directional causality from inflation in USA to inflation in South Africa as well as from inflation to broad money supply in South Africa.

Conclusion: The study contends that inflation in South Africa is both structural and monetary phenomenon. To the extent that inflation in the USA demonstrates robust influence on inflation in South Africa, it is submitted that policy makers in South Africa could moderate inflation by strengthening international competitiveness of the South African economy.

Keywords: Inflation, South Africa, USA inflation, Exchange rate, GDP, Size of government

1. INTRODUCTION

Ability to maintain inflation rate in an economy at significantly low levels is one of the trumpeted achievements of every incumbent government especially in Africa. This is because high inflation in an economy accounts for exchange rate and interest rate instability and an erosion of international competitiveness of the economy which undermines standards of living. However, the effect of inflation on economic growth and development has generated a great deal of controversy. Three schools of thought have emerged. Structuralist school of thought maintains that inflation is growth-promoting because it results in forced savings (Darrat, 1988; Taylor, 1979; Wächter, 1976; Wallich, 1969). They argue that inflation, when anticipated could induce portfolio substitution favoring capital assets over less productive monetary assets. The distortionist school asserts that higher inflation undermines growth by distorting investment patterns and hampering propensities to save and invest (Bruno and Easterly, 1998; Fischer, 1993; McKinnon, 1973; Johnson, 1967). McKinnon (1973), in particular, has long argued that money balances and capital goods are complementary (rather than substitutable) in developing countries. Thus, with the anticipation of higher inflation, money balances become less

* +2330244784290 FAX: +23303220637
E-mail address: madusei10@yahoo.com.

attractive to hold which discourages capital formation. The macrorational expectationist school of thought maintains that inflation, when anticipated, has no effects on the real side of the economy (Lucas, 1973; Sargent, 1975). The proponents of this school of thought argue that economic agents form their inflationary expectations rationally and thus only can make unsystematic forecasting errors. As a result, systematic (anticipated) changes in the inflation rates cannot stimulate real responses because they are taken into account already by rational economic agents.

Just as the impact of inflation on economic growth has been caught in the web of academic controversy so are the determinants of inflation in an economy. Theoretically, whereas monetarists argue that inflation is a monetary phenomenon, structuralists maintain that structural bottlenecks such as inelastic supply of foodstuffs cause price increases. Empirically, a lot of studies have been done on the causes of inflation in many countries with mixed findings (Domaç and Yücel; 2005; Ho and McCauley 2003; Loungani and Swagel, 2001; Durevall and Ndung'u, 1999; Sowa and Kwakye, 1993).

In South Africa, the determinants of inflation have been studied with mixed results (Akinboade *et al.*, 2004; Pretorius and Smal, 1994; De Wet and Associates, 1987; Moore and Smit, 1986; De Kock Commission, 1985). Whereas some of the studies argue that inflation in the country is a structural phenomenon (Akinboade *et al.*, 2004), others argue that it is a monetary phenomenon (De Kock Commission, 1985). This presupposes that revisiting the determinants of inflation in South Africa is tenable.

South Africa is endowed with an enviable natural resources; well developed financial, legal, communications, energy, and transport sectors; a stock market that is counted among the 10 largest stock markets in the world; and a modern infrastructure(www.umsi.edu/services/govdocs/wofact2006/geos/sf.html#Econ). Therefore, the determinants of her inflation may serve as a guide for monetary and fiscal policy formulation in other African countries that have been grappling with inflation phenomenon. Besides, South African economic policy is fiscally conservative, but pragmatic, focusing on targeting inflation and liberalizing trade as a means of increasing job growth and household income, a policy orientation that pertains in most African countries. Thus, delving into factors accounting for her inflation may be representative of determinants of inflation in most African countries.

The rest of the paper is sectionalized as follows. The next section reviews the empirical literature followed by the methodology section. Estimation results section is the penultimate section followed by the conclusions, recommendations and limitations of the study section.

Empirical Evidence

One of the major factors that have been found to determine domestic inflation is exchange rate. Exchange rate depreciation directly affects the prices (domestic currency units) of tradable goods and also indirectly affects the general price level if pricing decisions are influenced by the cost of imported inputs. Besides, when nominal wages are explicitly or impliedly indexed to a foreign currency, exchange rate depreciation may cause higher nominal wages (Akinboade *et al.*, 2004). Agenor and Montiel (1996) report that exchange rate may have short-term impact on inflation in small, open developing countries. Ho and McCauley (2003) provide evidence which suggests that the significance of the exchange rate in the evolution of domestic inflation tends to be greater in Emerging Market Economies (EMEs) compared to advanced economies. Loungani and Swagel (2001) employs vector autoregressions (VARs) to study the experience of 53 developing countries between 1964 and 1998 and report that either money growth or exchange rate movements (depending on the ordering) account for two-thirds of the variance of inflation at both short and long horizons. Regarding money growth-inflation connection, De Grauwe and Polan (2005) use a sample of 160 countries over a thirty-year period to study the relationship and report mixed results. They report a strong positive link between inflation and money growth from their full sample and attribute it to the presence of hyper inflation countries in the sample. Their study, however, demonstrates a weak link between inflation and growth for low inflation countries (i.e. countries with average inflation rate of less than 10% over the study period).

Closely related to exchange rate theory is the purchasing power parity (PPP) theory which suggests that in a common currency arrangement, the rate of inflation of the dominant country should influence the inflation rates of smaller countries. Holmes (2000) confirms PPP theory in 27 African less developed countries using quarterly data for the period 1974-1997. Kargbo (2006) also confirms the relevance of PPP in Africa.

Sowa and Kwakye (1993) study inflationary trends and control in Ghana and find that supply factors constitute a much stronger inflationary force than monetary factors and that the influence of exchange rate adjustments is not strong. However, a recent study in Ghana by Adu and Marbuah (2011) reports that real output, nominal exchange rate, broad money supply, nominal interest rate and fiscal deficit play a dominant role in inflationary process in Ghana. The study concludes that inflation in Ghana is determined by a combination of structural and monetary factors. In Sierra Leone,

Kargbo (2011) finds that exchange rates, money supply, government consumption, terms of trade, and real GDP are main determinants of inflation in the long-run.

In Kenya, Durevall and Ndung'u (1999) find that exchange rate, foreign prices and terms of trade have long-run effects on inflation whilst money supply and interest rate only have short-run effects on inflation. Indeed, the literature documents studies that establish a correlation between trade openness and inflation (Bowdler and Nunziata, 2006; Lane, 1997; Romer, 1993). Bowdler and Nunziata (2006) report that increased openness abates the probability of inflation start, both directly, and indirectly through restricting the role of general elections in causing inflation starts. Lane (1997) and Romer (1993) present empirical evidence showing that openness and inflation are negatively correlated across countries. On the supply side, it has been argued that greater trade openness is likely to heighten competition in product markets, such that firms with monopoly power are less able to push through inflationary price increases (Aron and Muellbauer, 2000).

Another factor that is known to influence inflation is expectation. Loungani and Swagel (2001) report that inflation expectations also play an important role in the inflation process in developing countries. They find that past realizations of inflation explain between 10 and 20 percent of inflation movements.

Employing pooled probit analysis, Domaç and Yücel (2005) investigate the factors associated with the start of 24 inflation episodes in 15 EMEs between 1980 and 2001 and find that increases in the output gap, agricultural shocks, and expansionary fiscal policy raise the probability of inflation starts in EMEs. Their findings also indicate that a more democratic environment and an increase in capital flows relative to GDP reduce the probability of inflation start. However, the findings of Loungani and Swagel (2001) suggest that cost shocks or the output gap are not significant factors affecting the evolution of inflation in 53 developing countries.

Rwegasira (1977) adduces evidence to suggest that the characterization of inflation as a monetary phenomenon is unsatisfactory in the case of Tanzania. Applying post-Keynesian models to study African economies, Greene (1989) reports that inflation is caused by exogenous shocks such as a sudden rise of imports, wage hikes over and above price rises, and a sudden increase in fiscal deficits or other cost-increasing factors. However, the final report of De Kock Commission (1985) makes a case for monetary causes of inflation in South Africa. Alternative causes of inflation such as salary and wage increases in excess of productivity growth, inadequate competition, tax increases, and imported inflation are found by the Commission to have less impact on inflation in South Africa. In a sharp critique of the Commission's report, Moore and Smit (1986) report that wage increases have had a powerful impact on inflation in South Africa. De Wet and Associates (1987) have also found that wage increases contribute to structural acceleration and cyclical upward movements of the inflation rate in South Africa. Their study finds that fiscal and monetary factors have contributed to cyclical movements in inflation but have not been major determinants of the secular upward trend in inflation. Pretorius and Smal (1994) have identified that changes in labour costs as well as the cost of imported goods influence prices in South Africa. Using quarterly data covering 1970.1 to 2000.2, Akinboade *et al.* (2004) develop a model that relates domestic inflation in South Africa to money market, labour market and foreign exchange market conditions. They demonstrate that inflation is largely a structural phenomenon. They report a positive correlation between labour costs, broad money supply, and domestic inflation. An increase in the rand or an increase in the normal effective exchange rate will lower domestic inflation in South Africa. In the long run, rising labour costs contribute significantly to inflation. Nominal interest rate is not a significant determinant of inflation in South Africa in the short run but in the long run it slightly reduces inflation. An increase in the broad money supply will contribute to domestic inflation in the long run (Akinboade *et al.*, 2004).

2. METHODOLOGY

The dependent variable in the model is the annual domestic inflation in South Africa (SINFL) and it is defined as the annual percentage change in the consumer price index. From the extant literature, the study has chosen the following explanatory variables: nominal exchange rate, GDP at current US\$ (GDP), prime lending rate (PLR), broad money supply as a percentage of GDP (M3), inflation in the United States of America (USINFL) and government spending on goods and services as a percentage of GDP (GS). GDP, M3 and PLR have been used to proxy quantity theory of money. Following the work of Akinboade *et al.* (2004), PLR has been used to represent nominal interest rates. GS has been used to proxy size of government (Barro and Sala-i-Martin 1995). According to Akinboade *et al.* (2004) the major trading partners of South Africa are Germany, United Kingdom, Japan and USA. However, purposively, the study has used the inflation data from the USA. In line with the work of Akinboade *et al.* (2004), one dummy variable (DASMC) is included to capture the structural break associated with the 1987 stock market crash. The dummy variable takes the value of 1 in 1987 and 0 otherwise. Another dummy variable (DAP) is introduced to capture the structural break associated with the collapse of the apartheid system in 1994. It takes the value of 1 from 1994 onwards and 0 otherwise. Summary of the variables in the model and their definitions have been provided in Table 1.

In line with the suggestion of Sarel (1996) we use the natural logarithm of all data. This means that we use Fully Modified Ordinary Least Squares (FMOLS) to investigate long-run relationship between the dependent variable and the independent variables. The use of FMOLS requires that we establish the order of integration of the variables as well as ascertain whether or not the variables are cointegrated. To this end, we employ Augmented Dickey Fuller Test and Phillips-Perron Test to investigate the order of integration of variables and Johansen Cointegration technique to ascertain whether or not the variables are cointegrated (Engle and Granger, 1987).

Two log-linear equations are estimated. Equation 1 does not consider structural break in the data but equation 2 does.

$$LSINFL = \delta_1 + \delta_2 LXRATE + \delta_3 LGDPPC + \delta_4 LPLR + \delta_5 LM3 + \delta_6 LGS + \delta_7 LUSINFL + \mu_t \quad (1)$$

$$LSINFL = \delta_1 + \delta_2 LXRATE + \delta_3 LGDPPC + \delta_4 LPLR + \delta_5 LM3 + \delta_6 LGS + \delta_7 LUSINFL + \delta_8 DASMCR + \delta_9 DAP + \mu_t \quad (2)$$

Where

LSINFL = Log of annual percentage change in South African consumer price index

LXRATE = Log of exchange rate

LGDPPC = Log of GDP per capita

LPLR = Log of prime lending rate

LM3 = Log of M3

LGS = Log of Government Final Consumption Expenditure as a Share of GDP (Size of government)

LUSINFL = log of annual percentage change in the USA consumer price index

DASMCR = Dummy variable for effect of 1987 stock market crash.

DAP = Dummy variable for the collapse of apartheid system in South Africa in 1994

μ_t = stochastic error term

Based on equation 1, we employ Error Correction Model (ECM) to investigate the short-run relationship between the dependent variable and the independent variables. The model is generally given as:

$$\Delta Z_t = \sum_{i=1}^{\rho-1} \psi_i \Delta Z_{t-i} + \alpha_0 + \eta_t \quad (3)$$

Assuming error correction to be absent ($R=0$), equation (2) can be rewritten as:

$$\Delta Z_t = \sum_{i=1}^{\rho-1} \Pi_i \Delta Z_{t-i} - \partial_1 Z_{t-k} + \alpha_1 + \varepsilon_t \quad (4)$$

Where,

$$\Pi_i = -I + \partial_1 + \partial_2 + \dots + \partial_i$$

$$I = 1, 2, 3, \dots, k-1 \text{ and } \partial = I - \partial_1 - \partial_2 - \dots - \partial_k$$

and p represents total number of variables considered in the model. The matrix Π captures the long-run relationship between the p variables (Shahbaz, 2009).

Annual time-series data covering the period of 1965-2006 gathered from World Development Indicators (WDI) (<http://www.worldbank.org>) have been used. The use of time series is tenable because, as Jalil and Ma (2008) observe, time series analyses provide an opportunity to study the causality pattern.

Table 1: Definitions of Variables

Variable	Definition
LSINFL	The log of annual percentage change in the consumer price index in South Africa
LXRATE	Natural logarithm of the annual average exchange rate between the rand and the US dollar based on

	monthly averages as determined by national authorities
LGDP	Natural logarithm of GDP at current US\$
LPLR	Natural logarithm of lending rate charged by financial institutions when they lend to their prime customers
LM3	Natural logarithm of broad money supply as a percentage of GDP
LGS	Natural logarithm of general government consumption as a percentage of GDP.
LUSINFL	Log of annual percentage change in the USA consumer price index
Dummy for Asian stock market crash(DASMC)	=1 in 1987; =0 otherwise
Dummy for the collapse of the apartheid system in 1994 (DAP)	=1 from 1994 onwards; =0 otherwise

3. RESULTS AND DISCUSSION

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Tests have been used to test the order of integration of the individual variables. Tables 2 and 3 display the results of these tests. As can be seen the results reveal that all the variables are stationary at their 1st difference form.

Table 2: ADF and PP Tests Results

Variables	ADF TEST			PP TEST		
	Test Statistic	Lags	Order of integration	Test Statistic	Bandwidth	Order of integration
LSINFL	-1.76	9		-1.39	15	
Δ LSINFL	-4.62***	3	I(1)	-9.43***	43	I(1)
LXRATE	-2.75	1		-2.23	0	
Δ LXRATE	-4.62***	0	I(1)	-4.52***	4	I(1)
LGDP	-0.13	0		-6.68	2	
Δ LGDP	-3.90**	0	I(1)	-3.75**	10	I(1)
LPLR	1.15	5		-1.12	7	
Δ LPLR	-5.6***	4	I(1)	-8.62***	38	I(1)
LUSINFL	-3.44	0		-3.41	9	
Δ LUSINFL	-5.81***	1	I(1)	-9.68***	39	I(1)
LM3	2.72	5		1.7	5	
Δ LM3	-4.84***	0	I(1)	-4.8**	3	I(1)
LGS	-1.64	0		-1.4	14	
Δ GS	-4.96***	0	I(1)	7.57***	36	I(1)

Notes: Reject at 10% (*), 5 %(**) and 1% (***) significance levels

The results produced above lend credence to the use of FMOLS, the most advanced technique for the investigation of long-run relationships among the variables in our model (Shahbaz, 2009). Lag length of VAR model is selected at 3 on the basis of Akaike information criterion (AIC). The results of the Unit-Root estimations meet the condition for performing Johansen Cointegration Test. From Table 4 it can be seen that for the null hypothesis of no cointegration ($R=0$) among the variables in the model, the Trace Test statistic is obtained at 428.96 which is above 1% and 5% critical values as shown by the reported probability values. This, therefore, rejects the null hypothesis of $R \leq 0$ in favor of the alternative hypothesis $R=1$. In the same vein, for the null hypothesis $R=1$, the Trace Test is obtained at 289.07 which is above 1% and 5% critical values, thus rejecting the null hypothesis $R \leq 1$ in favor of the alternative hypothesis $R=2$. This trend continues to the sixth null hypothesis $R \leq 6$ which reports the Trace Test value of 5.5912 which is above 1% and 5% critical values. It is, therefore, empirically tenable for us to conclude that there are seven cointegrating relationships among

inflation, exchange rate, GDP, interest rate, US inflation, broad money supply and size of government in South Africa. The Maximum Likelihood Test results also reported in Table 4 support the conclusion that there are seven cointegration relationships among the seven variables in the model. The presence of cointegration relationships among the seven variables permits the estimation of our models.

TABLE 4: JOHANSEN AND MAXIMUM LIKELIHOOD TEST FOR COINTEGRATION

Hypotheses	Trace Test	5% critical value	P-value **	Hypotheses	Max. Eigen Value	5% critical value	P- Value
R=0	428.96	125.62	0.0001	R=0	139.89	46.231	0.0000
R≤1	289.07	95.754	0.0000	R=1	95.914	40.078	0.0000
R≤2	193.16	69.819	0.0000	R=2	73.782	33.877	0.0000
R≤3	119.38	47.856	0.0000	R=3	58.268	27.584	0.0000
R≤4	61.107	29.797	0.0000	R=4	31.659	21.132	0.0000
R≤5	29.448	15.495	0.0002	R=5	23.857	14.265	0.0000
R≤6	5.5912	3.8415	0.0180	R=6	5.5912	3.8411	0.0180

Note: ** Implies McKinnon-Haug-Michelis (1999) p-values

The results of equations 1 and 2 are reported in Tables 5 and 6. The adjusted R^2 for both equations is 0.65. The significance of the F-statistic in both equations indicates that the explanatory variables jointly and significantly explain the dependent variable. The results of Breusch-Godfrey LM and Autogressive Conditional Heteroscedascity (ARCH) Tests suggest that there is no serial correlation in the series and there is no autoregressive conditional heteroskedasticity (ARCH) in the residuals respectively.

Table 5: FMOLS Regression Results: Equation 1

Dependent variable =LSINFL			
Variable	Coefficient	t-statistic	Prob.
Constant	4.8978	0.8008	0.4288
LXRATE	-0.1353	-0.3342	0.7403
LGDP	-0.1947	-0.8464	0.4033
LPLR	0.6234	1.8661	0.0707*
LUSINFL	0.4265	2.0762	0.0455**
LM3	-1.7947	-2.0978	0.0434**
LGS	2.5692	2.5485	0.0155**
Adjusted R^2 = 0.65 F-Statistic= 13.172 (0.0000) ARCH Test= 0.1552(0.1628) Breusch-Godfrey LM Test= 9.9846(0.1253)* N=41			

*Figures in parenthesis are probability values. Note***, **, * represent 1%, 5% and 10% significance levels respectively

Table 6: FMOLS Regression Results : Equation 2

Dependent variable =LSINFL			
Variable	Coefficient	t-statistic	Prob.
Constant	3.3438	0.5389	0.5937
LXRATE	-0.0906	-0.2230	0.8249
LGDP	-0.0415	-0.1641	0.8707
LPLR	0.6943	1.9129	0.0647*
LUSINFL	0.3744	1.7926	0.0825*
LM3	-1.6121	-1.8208	0.0780*
LGS	1.4554	1.1626	0.2536
DASMC	0.2652	0.6327	0.5314
DAP	-0.3921	-1.2967	0.2040
Adjusted R ² = 0.65 F-Statistic= 10.2223 (0.000001)* ARCH Test=0.6553(0.6452) Breusch-Godfrey LM Test= 8.7314(0.1202) N=41			

***Figures in parenthesis are probability values. Note ***, **, and * represent 1%, 5% and 10% significance levels respectively**

Tables 5 and 6 show that nominal exchange rate as well as GDP is negatively related to inflation in the long run. However, this is statistically insignificant. On the other hand, nominal prime lending rate has a positive, statistically significant relationship with inflation in the long run. This contradicts the work of Akinboade *et al.* (2004) who find a negative and statistically significant correlation between inflation and nominal prime lending rate in South Africa. The positive relationship between inflation and nominal prime lending rate may be explained in terms of cost-push inflation. As financial institutions become inefficient in their operations coupled with lack of confidence in the economy and tend to increase their lending rate to cushion themselves, firms who borrow funds and operate in less or no competitive environment tend to increase their prices which lead to price escalation in the economy. Less competitive banking environment could also account for this finding. Despite the fact that South Africa has a well-developed and highly sophisticated financial sector few banks dominate the banking sector. Oldhiambo (2010) reports that by the mid 1990s, about 95% of the total assets of banks were controlled by only four banking groups (Amalgamated Bank of South Africa (ABSA), Standard Bank, First National Bank and Nedbank) whilst the remaining 5% of the banks assets spread among some 27 local banks, 9 foreign-controlled banks, and a few branches of foreign banks as well as some mutual banks. Again, an increase in the lending rate as a contractionary policy could also account for this. As the central bank raises its base rate as a way of reducing money supply, cost of capital rises which cripples entrepreneurship leading to price increases in the long run.

The results in Table 5 show that there is a strong influence of US inflation on inflation in South Africa. In the long run, about 43% of the increase in domestic prices is explained by increases in the US prices. Even when we control for Asian stock market crash and the collapse of the apartheid system in 1994, the influence of US inflation on South African inflation is still evident. The results of the sensitivity analysis using Two-Stage Least Squares regression technique reported in Table 7 also confirm the positive relationship between inflation in South Africa and that of the USA. However, the strong influence of US prices is not surprising given the fact that USA is one of South Africa's major trading partners (Akinboade *et al.*, 2004). It is, therefore, reasonable for us to argue that South Africa suffers from imported inflation.

Contrary to the quantity theory of money, broad money supply has a negative, statistically significant relationship with inflation in equations 1 and 2. The negative relationship between inflation and broad money supply could be explained in terms of how additional supply of money is spent in the economy. If an additional increase in money supply is spent on productive ventures such as construction of roads and hospitals since such ventures have longer gestation periods, in the short run the economy will experience an appreciation in inflation. However, when such productive ventures begin to bear fruits they can bring inflation down. We are, therefore, inclined to believe that the monetarists' hypothesis that money supply accounts for inflation only holds in the short-run. In the long run, depending on how productively an additional supply of money is spent the economy could experience no variation in its inflation.

Size of government proxied by government spending on goods and services as a percentage of GDP has a statistically significant, positive relationship with inflation in equation 1. The sensitivity analysis results reported in Table 7 confirms this relationship. However, as can be seen in Table 6, the introduction of dummy variables controlling for Asian Stock market crisis and the collapse of the apartheid system causes size of government to be positively but insignificantly

related to inflation. This suggests that the bigger the government of South Africa becomes the more likely that the economy will experience price increases. One reason may be crowding out effect which results from competition between government and the private sector for funds in the financial markets. This competition usually favors government and as a consequence the private sector is denied financial resources for productive ventures. This negatively affects economic growth and, when demand for goods and services either remains constant or increases, supply-driven inflation ensues.

Table 7: Sensitivity Analysis: Two-Stage Least Squares Regression Based on Equation 1

Dependent variable =LSINFL			
Variable	Coefficient	t-statistic	Prob.
Constant	19.0066	1.4578	0.1543
LXRATE	1.2370	1.1246	0.2689
LGDP	-0.9515	-1.5953	0.1202
LPLR	0.3419	0.4997	0.6206
LUSINFL	1.2873	2.0872	0.0447**
LM3	-2.4934	-1.4713	0.1507
LGS	4.9463	2.6400	0.0126**
Adjusted R ² = 0.4 F-Statistic= 8.2186 (0.000018) ARCH Test 1.3863(0.2390)* N=40 Breusch-Godfrey LM Test=11.4013 (0.1220)*			

Instrument list: log(SINFL(-1)); log(XRATE(-1)); log(GDP(-1)); log(PLR(-1)); log(USINFL(-1)); log(M3(-1)); log(GS(-1))

***Figures in parenthesis are probability values. Note ***, **, * represent 1%, 5% and 10% significance levels respectively**

The ECM results are presented in Table 8. The adjusted R² is 0.38. The results of Breusch-Godfrey LM and Autogressive Conditional Heteroscedascity (ARCH) Tests suggest that there is no serial correlation in the series as well as no autoregressive conditional heteroskedasticity (ARCH) in the residuals. The disequilibrium error term is significant and negative confirming the already made assertion that the variables are cointegrated. The error term of approximately -0.89 indicates that there is about 89% feedback from the previous year disequilibrium into the short run dynamic process, and that errors or residuals within the estimated equation are corrected 89% in a year.

In Table 8 it can be observed that except GDP none of the variables has a significant short-run relationship with inflation. In the short run, GDP is positively related to inflation. This finding supports the view that in South Africa the effects of higher real income on raising the price level outweigh the impact that the increased supply of goods and services can have on curbing price rises. This is certainly plausible in a developing country like South Africa because a large proportion of output such as commercial agriculture and manufacturing in Africa is strongly geared towards production for export, and hence growth in these sectors does not provide additional goods and services for the domestic economy. This finding lends credence to the initial Keynesian explanation of inflation that evolved from Keynes' analysis of effective demand. According to the theory, inflation occurs when demand exceeds the potential output of the economy. In Keynes' analysis, the difference between aggregate demand and potential level of output at full employment is termed the inflationary gap. The positive impact of real income on inflation smacks of oligopolistic or monopolistic environment in South Africa. Imperfectly competitive firms tend to ask a higher price for their products than highly competitive firms. In other words, prices that are determined under imperfectly competitive conditions are less sensitive to changes in demand than prices determined in more competitive markets. This calls for more radical reforms in the economy. Promotion of more entrepreneurship development programmes coupled with financial and logistical support is one of the policy options that could address this phenomenon. Pursuit of productive foreign direct investment in the South African economy is another policy initiative that could be explored.

Table 8: Results of ECM of version of Equation 1

Dependent variable =ΔLSINFL			
Variable	Coefficient	t-statistic	Prob.
Constant	-0.6499	-2.9292	0.0063***
ΔLXRATE	-0.0582	-0.1302	0.8972
ΔLGDP	4.7123	2.9764	0.0056***
ΔLPLR	0.2067	0.5816	0.5650
ΔLUSINFL	0.0880	0.5513	0.5854
ΔLM3	1.4274	0.8721	0.3899
ΔLGS	1.4525	1.3266	0.1943

$\Delta LSINFL(-1)$	0.2884	1.8024	0.0812*
CR (-1)	-0.8862	-4.8558	0.0000***
F-statistic 4.0479 (0.002173) Adjusted $R^2 = 0.38$ ARCH Test = 0.9090(0.340382)* Breusch-Godfrey LM Test=3.6907 (0.1596)* N=40			

*Figures in parenthesis are probability values. Note: ***, **, * represent 1%, 5% and 10% significance levels respectively

The results of the Granger Causality Tests are presented in Table 9. As can be observed, there is uni-directional causality from inflation in the USA to inflation in South Africa. The results also indicate that there is uni-directional causality from inflation to broad money supply.

Table 9: Pairwise Granger Causality Tests. Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
LUSINFL does not Granger Cause LSINFL	40	3.32203	0.047753
LSINFL does not Granger Cause LUSINFL		0.08003	0.923264
LGS does not Granger Cause LSINFL	40	0.22636	0.798595
LSINFL does not Granger Cause LGS		0.51676	0.600933
LM3 does not Granger Cause LSINFL	39	0.80153	0.456941
LSINFL does not Granger Cause LM3		3.78492	0.032801
LPLR does not Granger Cause LSINFL	40	0.32396	0.725433
LSINFL does not Granger Cause LPLR		1.72769	0.192515

4. CONCLUSION

The paper seeks to ascertain whether inflation in South Africa is a structural or monetary phenomenon. The findings suggest that in the short-run, nominal exchange rate, nominal prime lending rate, consumer price index in the USA, broad money supply and size of government are not likely to influence prices in South Africa. Contrary to the position of the quantity theory of money, income has been found to be positively related to prices in South Africa in the short run but insignificantly, negatively related to prices in the long run. In the long run, whereas nominal exchange rate, inflation in USA, and government spending are positively related to inflation, broad money supply is negatively related to inflation. The study, therefore, concludes that inflation in South Africa is both structural phenomenon and monetary phenomenon. Evidence also supports the conclusion that South Africa is import-dependent, resulting in about 43% of her inflation explained by inflation in the USA. One policy recommendation that may be in the best interest of consumers is that South African government should provide more incentives to domestic producers so that they can produce more and compete effectively in the global market. Another policy option (that may be the last resort) is import substitution industrialization (ISI). The government of South Africa should embark upon ISI aimed at reducing the import dependence. As a short-run measure, subject to international treaties/accords to which South Africa is a signatory, the government can impose higher tariffs on those imports which the local industries have the capacity to produce. This may bring prices down. There appears to be monopolistic or oligopolistic markets in South Africa which make prices increase even in the midst of increases in goods and services. The government should break these markets through effective and efficient reforms including encouraging more firms into such markets to prevent price fixing.

One obvious weakness of this paper is that it has relied on the data from survey reports gathered by the World Bank (<http://www.worldbank.org>). Thus, the validity of our conclusions is limited to the extent to which these data are credible. We would, therefore, recommend a follow-up study using a different dataset. Another weakness of the paper which could be an agenda for future research is its failure to undertake data disaggregation to further explore the data.

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