Is Inflation in South Africa a Structural or Monetary Phenomenon?

Michael Adusei[1*]

[1]*Department of Accounting and Finance, Kwame Nkrumah University of Science and Technology, Kumasi-Ghana.*

Author's contribution

The only author MA performed the whole research work. Author MA wrote the first draft of the paper. Author MA read and approved the final manuscript.

Research Article

ABSTRACT

Aim: The aim of the study is to investigate whether or not inflation in South Africa is a structural 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 pair wise Granger Causality Test technique to analyze annual time series data from South Africa.
Results: The findings suggest that in the short run, openness of the South African economy, nominal interest rate, inflation in USA, broad money supply and government spending are not likely to influence prices in South Africa. Instead, the paper finds GDP as a significant determinant of prices in South Africa in the short run. In the long run without controlling for structural breaks, openness of the South African economy to the rest of the world, inflation in the USA, GDP, broad money supply and size of government are significant determinants of inflation in South Africa. However, when we control for the Asian stock market crash and the collapse of the apartheid system, only openness of the South African economy to the rest of the world and broad money supply are the significant determinants of inflation. Nominal interest rate is not a significant determinant of inflation in South Africa. Granger Causality Tests reveal that there is uni-directional causality from inflation in the USA and GDP to inflation in South Africa as well as from inflation to broad

_____

Corresponding author: Email: madusei10@yahoo.com;

money supply in South Africa.

Conclusion: The study contends that inflation in South Africa is a structural as well as monetary phenomenon. To the extent that inflation in the USA as well as openness of the South African economy to the rest of the world 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.

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. Structualist school of thought maintains that inflation is growth-promoting because it results in forced savings [1,2,3,4]. 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 [5,6,7,8]. In particular [7] 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 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 [9,10]. 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 [11,12,13,14,15].

In South Africa, the determinants of inflation have been studied with mixed results [16,17,18,19,20]. Whereas some of the studies argue that inflation in the country is a structural phenomenon [16], others argue that it is a monetary phenomenon [20]. This presupposes that revisiting the determinants of inflation in South Africa is tenable.

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.

1.1 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 [16]. Exchange rate may have short-term impact on inflation in small, open developing countries [21]. There is 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 [12]. A study 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 [13]. Regarding money growth-inflation connection [22] 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. PPP theory is confirmed in 27 African less developed countries using quarterly data for the period 1974-1997[23]. Another study also confirms the relevance of PPP in Africa [24].

Inflationary trends and control in Ghana is studied by [15] 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 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 [25]. The study concludes that inflation in Ghana is determined by a combination of structural and monetary factors [25]. In Sierra Leone, a study finds that exchange rates, money supply, government consumption, terms of trade, and real GDP are main determinants of inflation in the long-run [26].

In Kenya, [14] 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 [27,28,29]. Increased openness abates the probability of inflation start, both directly and indirectly through restricting the role of general elections in causing inflation starts [27]. Evidence exists that openness and inflation are negatively correlated across countries [28,29]. 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 [30].

Another factor known to influence inflation is expectation. Inflation expectations play an important role in the inflation process in developing countries [13]. Past realizations of inflation explain between 10 and 20 percent of inflation movements [13].

Employing pooled probit analysis, [11] 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 [13] suggest that cost shocks or the output gap are not significant factors affecting the evolution of inflation in 53 developing countries.

Evidence suggests that characterization of inflation as a monetary phenomenon is unsatisfactory in the case of Tanzania [31]. Applying post-Keynesian models to study African economies [32] 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 makes a case for monetary causes of inflation in South Africa [20]. 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, [19] report that wage increases have had a powerful impact on inflation in South Africa. De Wet and Associates have also found that wage increases contribute to structural acceleration and cyclical upward movements of the inflation rate in South Africa [18]. 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 [18]. Changes in labour costs as well as the cost of imported goods influence prices in South Africa [17]. Using quarterly data covering 1970.1 to 2000.2, [16] 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 [16].

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: openness of South African economy(OPEN), GDP at current US$ (GDP), nominal interest rate (INT), 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 INT have been used to proxy quantity theory of money. GS has been used to proxy size of government [33]. The major trading partners of South Africa are Germany, United Kingdom, Japan and USA [16]. However, purposively, the study has used the inflation data from the USA. In line with the literature [16], 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 literature, we use the natural logarithm of all data [34]. 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 [35].

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

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

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

Where
LSINFL = Log of annual percentage change in South African consumer price index.
LOPEN = Log of exports plus imports divided by GDP.
LGDPPC= Log of GDP per capita.
*LINT=l*og 1 + *r(r=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.
DASMC= 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:

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

With error correction, equation (3) can be rewritten as:

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

Where,

$\Pi_i = -I + \partial_1 + \partial_2 \ldots + \partial_i$
$I=1,2,3,\ldots k\text{-}1$ and $\partial = I - \partial_1 - \partial_2 \, \square \ldots \partial_k$

and *p* represents total number of variables considered in the model. The matrix Π captures the long-run relationship between the *p* variables [36].

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 time series analyses provide an opportunity to study the causality pattern [37].

Table 1. Definitions of variables

Variable	Definition
LSINFL	The log of annual percentage change in the consumer price index in South Africa
LOPEN	Log of exports plus imports divided by GDP
LGDP	Natural logarithm of GDP at current US$
LINT	Natural logarithm 1 + *r (r= prime* 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 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

	ADF test			PP test		
Variables	Test statistic	Lags	Order of integration	Test statistic	Bandwidth	Order of integration
LSINFL	-1.76	9		-1.39	15	
ΔLSINFL	-4.62***	3	I(1)	-9.43***	43	I(1)
LOPEN	-2.17	0		-2.28	4	
ΔOPEN	-5.72	0	I(1)	-5.79***	13	I(1)
LGDP	-0.13	0		-6.68	2	
ΔLGDP	-3.90**	0	I(1)	-3.75**	10	I(1)
LINT	1.14	5		-1.13	7	
ΔLINT	-5.58***	4	I(1)	-8.59***	38	I(1)
LUSINFL	-3.44	0		-3.41	9	
ΔLUSINFL	-5.81***	1	I(1)	-9.68***	39	I(1)
LM3	2.72	5		1.7	5	
ΔLM3	-4.84***	0	I(1)	-4.8**	3	I(1)
LGS	-1.64	0		-1.4	14	
ΔGS	-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 (Shahbaz, 2009). Lag length of VAR model is selected at 2 on the basis of Sequential modified LR Test, Final Prediction error and Hannan-Quinn information criterion. The results of the Unit-Root estimations meet the condition for performing Johansen Cointegration Test. From Table 3 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 199.37 which is above 1% and 5% critical values as shown by the reported probability values. This, therefore, rejects the null hypothesis of R=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 137.28 which is above 1% and 5% critical values, thus rejecting the null hypothesis R=1 in favor of the alternative hypothesis R=2. This trend continues to the third null hypothesis R=3 which reports the Trace Test value of 55.979 which is above 1% and 5% critical values. It is, therefore, empirically tenable for us to conclude that there are four cointegrating relationships among inflation, openness of South African economy, GDP, nominal interest rate, US inflation, broad money supply and size of government in South Africa. The Maximum Eigenvalue Test results also reported in Table 3 support the conclusion that there are four cointegration relationships among the seven variables in the model. The presence of cointegration relationships among the seven variables permits the estimation of our models.

The results of equations 1 and 2 are reported in Tables 4 and 5. The adjusted R^2 for both equations is 0.74. 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 3. Johansen and maximum eigenvalue test for cointegration

Hypotheses	Trace test	5% critical value	p-value**	Hypotheses	Max. eigenvalue stat.	5% critical value	p-value
R=0	199.37	125.62	0.0000	R=0	62.093	46.231	0.0005
R=1	137.28	95.754	0.0000	R=1	45.483	40.078	0.0112
R=2	91.797	69.819	0.0003	R=2	35.818	33.877	0.0290
R=3	55.979	47.856	0.0072	R=3	30.284	27.584	0.0220
R=4	25.695	29.797	0.1381	R=4	18.129	21.132	0.1251
R=5	7.5665	15.495	0.5129	R=5	5.851	14.265	0.6324
R=6	1.7153	3.8415	0.1903	R=6	1.7153	3.841	0.1903

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

Table 4. FMOLS regression results: equation 1

Dependent variable =LSINFL			
Variable	Coefficient	t-statistic	p-value
Constant	1.9283	0.5605	0.5789
LOPEN	1.0846	1.9619	0.0583**
LGDP	-0.2183	-2.2850	0.0289**
LINT	0.4720	1.4676	0.1517
LUSINFL	0.2255	1.7047	0.0976*
LM3	-1.5417	-1.6919	0.1001*
LGS	1.8883	1.9377	0.0613*
$LSINFL_{t-1}$	0.3650	2.2154	0.0337**

Adjusted R^2 = 0.74   F-Statistic= 17.351 (0.000000) Breusch-Godfrey Serial Correlation LM Test= 3.1274(0.1628) ARCH Test= 0.3628(0.8341)[1] N=41

[1]=*Figures in parenthesis are p-values. Note***, **, * represent 1%, 5% and 10% significance levels respectively.*

Tables 4 and 5 show that openness of the South African economy is positively related to inflation in the long run which suggests that as South African economy becomes more open to the rest of the World her inflation worsens. From Table 4 it can be observed that an increase in GDP reduces inflation in the long run. However, when we control for the Asian stock market crash and the collapse of the apartheid system an insignificant relationship is reported in Table 5. From Tables 4, 5 and 6 it can be observed that nominal interest rate has no significant relationship with inflation in the long run.

Table 5. FMOLS regression results: equation 2

Dependent variable =LSINFL			
Variable	Coefficient	t-statistic	p-value
Constant	0.749427	0.210486	0.8347
LOPEN	1.321400	2.271830	0.0302
LGDP	-0.085665	-0.642116	0.5255
LINT	0.512995	1.458232	0.1548
LUSINFL	0.156477	1.094376	0.2822
LM3	-1.815547	-1.903900	0.0662
LGS	1.260637	1.150148	0.2589
DASMC	0.017580	0.048103	0.9619
DAP	-0.397015	-1.419351	0.1658
$LSINFL_{t-1}$	0.274954	1.555702	0.1299

Adjusted R^2 = 0.74   F-Statistic= 13.737 (0.000000) Breusch-Godfrey Serial Correlation LM Test= 2.1936(0.3339) ARCH Test= 0.1959(0.9067)[1] N=41

[1]=*Figures in parenthesis are p-values. Note***, **, * represent 1%, 5% and 10% significance levels respectively*

The results in Table 5 show that there is an influence of US inflation on inflation in South Africa. In the long run, about 23% of the increase in domestic prices is explained by increases in the US prices. However, 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 positive but statistically insignificant. The results of the sensitivity analysis using Two-Stage Least Squares regression technique reported in Table 6 reveal a strong positive relationship between inflation in South Africa and that of the USA. The strong influence of

US prices is not surprising given the fact that USA is one of South Africa's major trading partners [16]. This finding coupled with the positive impact of the openness of the South African economy on inflation provides grounds 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 results of the sensitivity analysis also confirm this. 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, negative relationship with inflation in equation 1. However, as can be seen in Table 5, 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 some improvement in its inflation. This may be attributed to South government prudent government expenditure on goods and services in the South African economy.

The ECM results are presented in Table 7. The adjusted R^2 is 0.53. 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 -0.95 indicates that there is about 95% feedback from the previous year disequilibrium into the short run dynamic process, and that errors or residuals within the estimated equation are corrected 95% in a year.

Table 6. Sensitivity analysis: two-stage least Squares regression based on equation 1

Dependent variable =LSINFL			
Variable	**Coefficient**	**t-statistic**	**p-value**
Constant	3.240130	0.612477	0.5444
LOPEN	1.384186	1.604514	0.1181
LGDP	-0.378914	-2.835312	0.0078**
LINT	0.465432	0.821196	0.4174
LUSINFL	0.459545	1.892273	0.0673*
LM3	-2.537262	-1.820415	0.0778*
LGS	4.042365	3.136362	0.0036***
Adjusted R^2 = 0.67	F-Statistic= 14.9842 (0.000000) N=40		

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

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

In Table 7 it can be observed that except GDP and $\Delta LSINFL_{t-1}$ none of the explanatory 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.

The results of the Granger Causality Tests are presented in Table 8. As can be observed, there is uni-directional causality from inflation in the USA to inflation in South Africa as well as from GDP to inflation. The results also indicate that there is uni-directional causality from inflation to broad money supply.

Table 7. Results of ECM

Dependent variable =$\Delta LSINFL$			
Variable	**Coefficient**	**t-statistic**	**p-value**
Constant	-0.460033	-2.152634	0.0392**
$\Delta LOPEN$	1.062675	1.621971	0.1149
$\Delta LGDP$	3.253112	2.137605	0.0405**
$\Delta LINT$	0.386684	1.074915	0.2907
$\Delta LUSINFL$	0.080394	0.540506	0.5927
$\Delta LM3$	-0.355529	-0.215382	0.8309
ΔLGS	1.546184	1.440097	0.1599
$\Delta LSINFL_{t-1}$	0.276215	1.726356	0.0942*
CR (−1)	-0.945953	-4.728357	0.0000***
F-statistic 4.2914 (0.001464)			
Adjusted R^2 = 0.53 ARCH Test = 1.1663(0.5581) Breusch-Godfrey LM Test=1.5093 (0.4701)[1]			
N=40			

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

Table 8. Pairwise granger causality tests. Lags: 2

Null Hypothesis:	Obs	F-Statistic	p-value
LUSINFL does not Granger Cause LSINFL	40	3.32203	0.04775[**]
LSINFL does not Granger Cause LUSINFL		0.08003	0.92326
LGS does not Granger Cause LSINFL	40	0.22636	0.79859
LSINFL does not Granger Cause LGS		0.51676	0.60093
LM3 does not Granger Cause LSINFL	39	0.80153	0.45694
LSINFL does not Granger Cause LM3		3.78492	0.03280**
LGDP does not Granger Cause LSINFL	40	2.79857	0.07456*
LSINFL does not Granger Cause LGDP		1.28002	0.29073

Note:***, **, * represent 1%, 5% and 10% significance levels respectively

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, openness of the South African economy, nominal interest rate, inflation in USA, broad money supply and government spending are not likely to influence prices in South Africa. Instead, the paper finds GDP as a significant determinant of prices in South Africa in the short run. In the long run without controlling for structural breaks, openness of the South African economy to the rest of the world, inflation in the USA, GDP, broad money supply and size of government are significant determinants of inflation in South Africa. However, when we control for the Asian stock market crash and the collapse of the apartheid system, only openness of the South African economy to the rest of the world and broad money supply are the significant determinants of inflation. Nominal interest rate is not a significant determinant of inflation in South Africa. Granger Causality Tests reveal that there is uni-directional causality from inflation in the USA and GDP to inflation in South Africa as well as from inflation to broad money supply in South Africa.

The study concludes that inflation in South Africa is structural as well as monetary phenomenon. Evidence also supports the conclusion that South Africa is import-dependent. 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.

ACKNOWLEDGEMENT

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Darrat AF. Does inflation inhibit or promote growth? Some time series evidence, Quarterly J Bus and Econ. 1988;27(4):113-134
2. Taylor L. Macro Models for developing countries, New York: McGraw-Hill Publishing Company; 1979.
3. Wächter SM. Latin American inflation: the structuralist monetarist debate, Lexington, Massachusetts: Lexington Books; 1976.
4. Wallich HC. Money and growth: a country cross section analysis, J Money, Credit and Banking. 1969;1:218-302.
5. Bruno M, Easterly W. Inflation crises and long-run growth. J Mon Econ. 1998;41:3–26.
6. Fischer S. The role of macroeconomic factors in growth. J Monetary Econ. 1993;32:485-512.
7. McKinnon R I. Money and Capital in Economic Development, Washington, D.C.: Brookings Institution; 1973.
8. Johnson HG. Is inflation a retarding factor in economic growth?, in D. Krivine (ed.), Piscai and Monetary Problems In Developing States, Proceedings of the 3rd Rehovoth Conference, New York: Praeger Publishing Company; 1967.
9. Lucas R E, Jr. Some international evidence on output- inflation tradeoffs. A Econ Rev. 1973;63:326-334.
10. Sargent TJ, Wallace N. Rational expectations, the optimal monetary instruments, and the optimal money supply rule. J Political Econ. 1975;83:241-254.
11. Domaç I, Yücel, E M. What triggers inflation in emerging market economies? Rev World Econ. 2005;141(1):141-164.
12. Ho C, McCauley R N. Living with flexible exchange rates: issues and recent experience in inflation targeting Emerging Market Economies. BIS Working Papers 130. Bank of International Settlements, Basle; 2003.
13. Loungani P, Swagel P. Sources of inflation in developing countries. Washington, D.C: IMF Working Paper 01/198; 2001.
14. Durevall D, Ndung'u N S. A dynamic model of inflation for Kenya, 1974-1996, IMF Working Papers 99/97, International Monetary Fund; 1999.
15. Sowa N K, Kwakye J K. Inflationary trends and control in Ghana. Research Paper No.22. African Economic Research Consortium, Nairobi; 1993.
16. Akinboade O A, Siebrits F K, Niedermeier E W. The determinants of inflation in South Africa: an econometric analysis, African Economic Research Consortium Research Paper. 143;2004.
17. Pretorius C J, Smal M M. A Macro-economic examination of the price formation process in the South Africa economy, South African Reserve Bank Quarterly Bulletin, March. 1994;25-37.
18. De Wet G L Associates. Inflasie in Suid-Afrika. Durban: Butterworths; 1987
19. Moore B J, Smit B W. Wages, money and inflation. S African J Econ. 1986;54(1):80-93.
20. De Kock Commision. Final report of the Commission of Inquiry into the Monetary System and Monetary Policy in South Africa. Pretoria: Government Printer; 1985.

21. Agenor P R, Montiel PJ. Development economics. New Jersey: Princeton University Press; 1996.
22. De Grauwe P, Polan M. Is inflation always and everywhere a monetary phenomenon. Scandinavian Journal of Economics. 2005;107(2):239-259
23. Holmes M J. Does purchasing power parity hold in African less developed countries? evidence from a panel data unit root test. J African Econ. 2000;9(1):63-78.
24. Kargbo J M. Purchasing power parity and real exchange rate Behaviour in Africa, A Finan Econ. 2006;16(1–2):169–183.
25. Adu G, Marbuah G. Determinants of inflation in Ghana: an empirical investigation. S African J. Econ. 2011;79(3):251-269.
26. Kargbo J M. Political instability and economic recovery in Sierra Leone: lessons in applied econometrics, modeling and policy making. New York: The Edwin Mellen Press, Lewiston; 2011.
27. Bowdler C, Nunziata, L. Trade openness and inflation episodes in the OECD, J Money, Credit and Banking. 2006;38(2):553-563.
28. Lane P. Inflation in open economies, J International Econ. 1997;42:327-347.
29. Romer D. Openness and inflation: theory and evidence. Quarterly J Econ. 1993;108:869-903.
30. Aron J, Muellbauer J. Inflation and output forecasts for South Africa: monetary transmission implications. Working Paper No. 23, Centre for the Study of African Economies: University of Oxford; 2000.
31. Rwegasira D G Inflation and economic development: some lessons from Tanzanian experience, Research & Statistics Dept., Bank of Tanzania; 1977.
32. Greene J. Inflation in African Countries: General Issues and Effects on the Financial Sector. IMF Working Paper WP/89/86. Washington, D.C.: International Monetary Fund; 1989
33. Barro R J, Sala-i-Martin X. Economic growth. Boston, Mass.: Mc- Graw Hill; 1995.
34. Sarel M. Nonlinear effects of inflation on economic growth, IMF Staff Papers, International Monetary Fund. 1996;43:199-215.
35. Engle R F, Granger C J. Cointegration and error-correction representation, estimation and testing. Econ. 1987;55:251–278
36. Shahbaz M A. Reassessment of finance-growth nexus for Pakistan: under the investigation of FMOLS and DOLS techniques, The ICFAI J Applied Econ. 2009;8(1):65-81.
37. Jalil A, Ma Y. Financial development and economic: time series evidence from Pakistan and China. J Econ Cooperation. 2008;29(2):29-68.

_____