Does Inflation Hamper Savings? An Empirical Assessment for Ghana

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A**bstract**

The paper examined the nature of the effect of inflation on savings in Open but Small economy of Ghana for 1970-2012 period using autoregressive distributed lag model (ARDL) and Ordinary Least Square models (OLS). The results show that there is significant negative effect of inflation on savings in the long run. The findings support the view that inflation hampers savings in the period under consideration. The findings support the inflation targeting policy of policy makers in the study area. Future studies should consider the examination of structural breaks and causal link between inflation and savings to allow for predictive conclusions.

Keywords: Savings**,** Income, ARDL, Inflation, Long Run,

Jel Classification: D91, E21, E31, O61, P24, P44

1Introduction

The importance of savings (defined as the difference between income and consumption) as a major determinant of economic growth has been discussed widely in the literature both theoretically and empirically. Theoretically, inflation (defined as an increase in the general price level of goods and services) affects economic growth and savings and that economic growth is affected by inflation rate through savings (Er, Tugcu, Coban, 2014; Chaturvedi, Kumar, Dholakia, 2008; Davidson and MacKinnon, 1982). Some theoretical and empirical studies (Modigliani & Shi, 2004; den Haan, 1990) have produced evidence in support of positive effect of inflation on savings whereas others (Mobin & Masih, 2014; Sussmuth, 2006; Loayza et al., 2000; Feldstein, 1982) have reported of negative link between inflation and savings. Evidence of neutral effect has also been reported in the literature (Sidrauski, 1967).

Inflation targeting policies in Ghana, over the years have not achieved the desired results, since single inflation rate have not been achieved successfully. The inflation rate according to Ghana Statistical Service (GSS, 2015) as at April 2015 stood at 19.5% and 17.0% in December 2014. In December 2012, the rate stood at 9.4% and 8.5% in December 2011. The nature of inflation has created uncertainty in the Ghana economy over the years. There is the need to investigate whether inflation has contributed positively or negatively to savings in Ghana. Few empirical works exist in literature on the study area and the current study adds to the literature. The aim of the paper is to contribute to the body of knowledge in literature on the determinants of saving by investigating the linear relationship among inflation, savings and economic growth in Ghana, by using autoregressive distributed lag model (ARDL) approach to cointegration over the period 1970 to 2012.

There are two testable assumptions related to inflation-savings nexus, which are as follows: (1) There is significant cointegration link between inflation and savings. (2) There is significant long run nexus between inflation and savings. The findings provide answers to research questions, which are, what is the nature of the relationship between inflation, savings, and economic growth in the long run? The paper is

limited to the use of secondary data, and as such, the findings might suffer from errors in variable. The estimated model is trivariate and as such might suffer from omitted variable bias. The study does not consider causality and structural breaks over time. Hence, future savings behaviour cannot be predicted. The rest of the paper looks at the literature review, methodology, empirical results, discussions, and conclusions.

2 Literature Review

The theoretical explanations of the link between inflation and savings in the literature have produced mixed findings (Heer & Susessmuth, 2006). Theoretically, according to researchers (den Haan, 1990; Davidson & MacKinnon, 1982; Jump, 1980; Siegel, 1979; Sidrauski, 1967; Stockman, 1981), inflation affects savings in many ways. Inflation increases savings since higher inflation rates create uncertainty in an economy, and risk-averse consumers saving against future changes in income. This is precautionary savings (Mobin & Masih, 2014).

Higher inflation rates cause increase in precautionary savings in an economy. Savings in an economy also increase with higher inflation rate through the real wealth effect since consumer increase savings in order to maintain certain levels of the real wealth in relation to their income. In higher inflation periods, consumer might postpone consumption of certain goods and that might results in increase in savings, other things equal (Deaton, 1991). Deaton (1991) model is called disequilibrium model of aggregate demand in the presence of unanticipated inflation. The model explains that consumers save involuntarily.

Other researchers such as Sidrauski (1967) and Stockman (1981) are of different view of the link between inflation and savings. Sidrauski (1967) explained in his general equilibrium model that inflation does not statistically significantly influence savings in the long run.Stockman (1981) supported the view of Sidrauski (1967) in cash-in-advance constraint model. Negative link between inflation and savings have been explained theoretically by other researchers (den Haan, 1990; Heer & Sussmuth, 2006; Feldstein, 1982). These researchers indicate that higher inflation rate reduces return on savings by consumers in an economy.

According to endogenous growth model, inflation statistically significantly affects growth negatively (Heer & Sussmuth, 2006; den Haan, 1990; Stockman, 1981). This link is widely studied in literature as compared to the examination of the link between inflation and savings (Heer & Suessmuth, 2006).

The empirical findings of the link among inflation, income, and savings are similar to that of the theoretical findings, and have been inconsistent. The discrepancies in the empirical findings are found in the works of Mobin and Masih (2014); Ahma and Mahmood (2013); Heer and Suessmuth (2006); Athukorala and Sen (2003); Narayan and Seema (2003); Ozcan et al. (2003); Agrawal (2001); Loayza and Shankar (2000); Davidson and MacKinnon (1982). For example, Mobin and Masih (2014) reported of significant negative effect of inflation on Islamic banks saving deposits and concluded that control of inflation is necessary for the expansion and growth of Islamic banking in Malaysian market. Ahmad and Mahmood (2013) findings in Pakistan indicated negative effect of inflation on savings for the period 1974-2010.

Heer and Suessmuth (2006) reported that higher inflation rate is linked with fewer savings during the Greenspan and Pre-Volcker Era (1965-1998), however, savings increased during the Volcker Era (1979-1987). Heer and Suessmuth (2006) explained that the vague influence of inflation on savings might results from the sample period used in the estimation. They concludedthat inflation increases savings or does not affect savings at all. Athukorala and Sen (2003) produced evidence of significant negative link between inflation and savings for for India, whereas Loayza and Shankar (2000) reported of significant positive effect of inflation on savings for India.

In the case of income and savings link, Farhan & Akram, 2011 argued for positive link for Pakistan; Loayza and Shankar (2000) reported of positive link for India; Agrawal (2001) for Asian countries and Ozcan et al. (2001) for Turkey. The growth of income levels has positive effects on savings. The positive findings support the Keynesian and permanent income hypothesis of income and savings in an economy. However, Ahma and Mahmood (2013) for Pakistan produced evidence of inverse relationship between inflation and savings, indicating that as income levels go up savings go down.The theoretical and empirical review indicates that the link between inflation and savings is not unanimous and not robust. This calls for further empirical works to shed more light on the theoretical assumption of positive effects of inflation on savings.

3 Research Methodology

3.1 Unit Root and Cointegration Test

The paper is based on quantitative research design. The link among inflation, income, and savings are explained quantitatively using time series data. The inflation-savings nexus is examined in three main steps. The unit root properties are examined using the Augmented Dickey-Fuller (1981) (ADF) unit root test method and the Kwiatkowski et al. (1992, KPSS) without structural breaks in the first step. The KPSS is used as a confirmatory test to the ADF test. Since these tests are extensively explained in the literature, the details are not provided in the current paper (see Ofori, Adjei, & Yeboah, 2015). The unit root properties are examined to avoid spurious results.

The Ordinary Least Square (OLS) is used to examine the linear association among the variables in a log-linear form. The long run relationship among the variables is estimated using the autoregressive distributed Lag (ARDL) or the Bound approach to cointegration in the third step. The ARDL approach was developed by Pesaran and Shin (1999) and Pesaran et al. (2001) and is used in the current study because of its many advantages. It is efficient estimator in small sample studies and allows for the use of different lags and been appropriate when the unit root properties are not known. The ARDL/Bound approaches to cointegration have also been described in the literature and as such are not provided in the current paper (Pesaran & Shin, 1999 for details).

3.2 The Model

The study is based on a trivariate model as specified in equation (1). The dependent variable is savings whereas the explanatory variables are inflation and economic growth. The control variable in the model is income (proxied by real gross domestic product). The model indicate that savings is a function of inflation and income. Data for the estimation of the model are taken from World Development Indicators (WDI-2012). The study period is from 1970-2012.

$$s_t = \inf_t + gdp_t + e_t \quad \text{.....(1)}$$

4 Discussions and Analysis

4.1 Time Series Plot

The time series plot results are shown in figure 1 to figure 6. The figures indicate that the series are unit root in levels (figure 1 to figure 3) but attained stationarity after first differenced (figure 4 to figure 6). The unit root properties are further examined scientifically using the ADF and the KPSS tests. The results are reported in Tables 1 to Table 4.

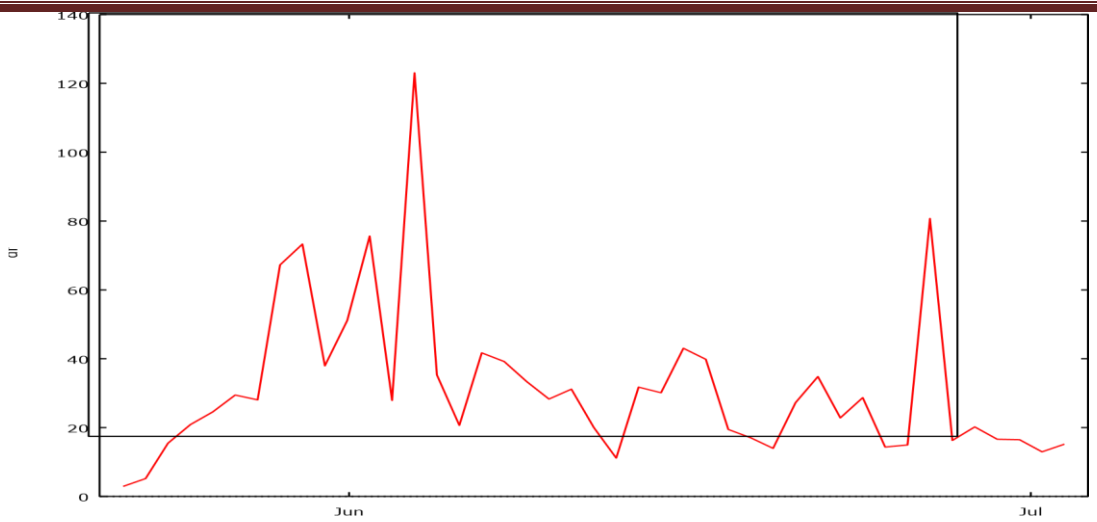

Figure 1. Time series Plot of inf in levels

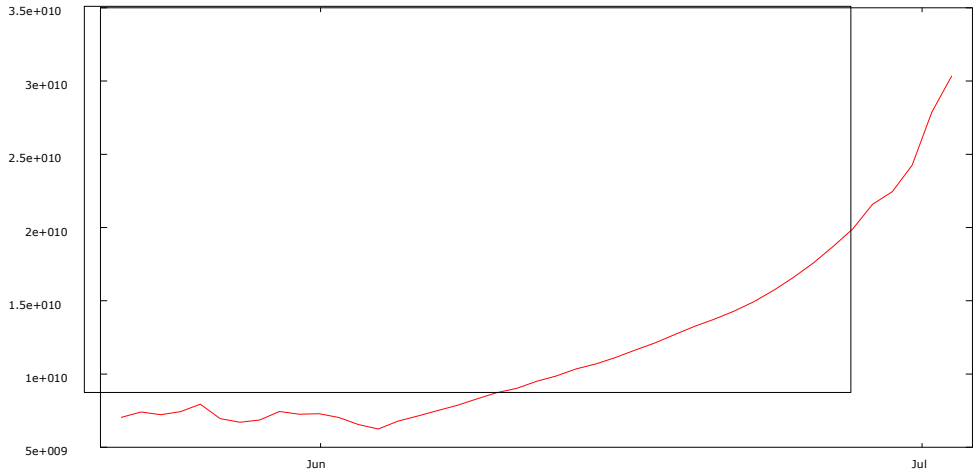

Figure 2. Time series Plot of gdp in levels

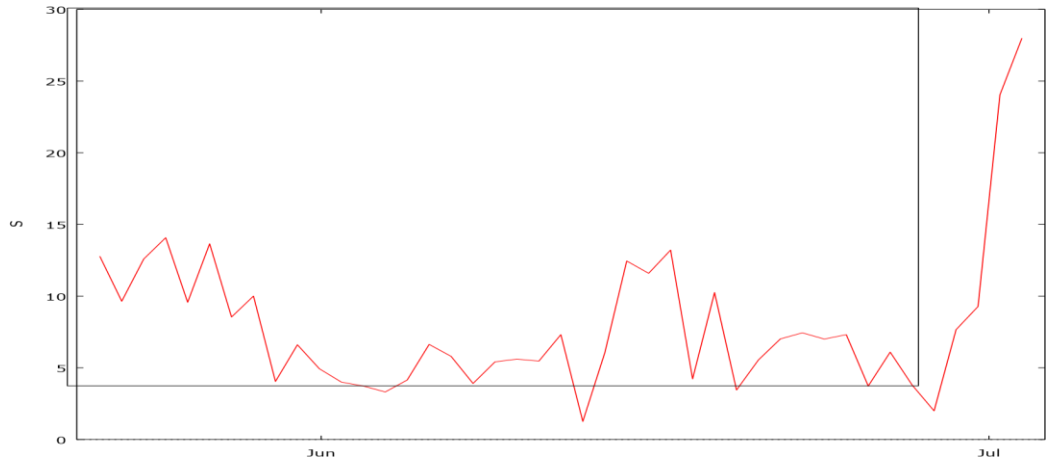

Figure 3. Time series Plot of S in levels

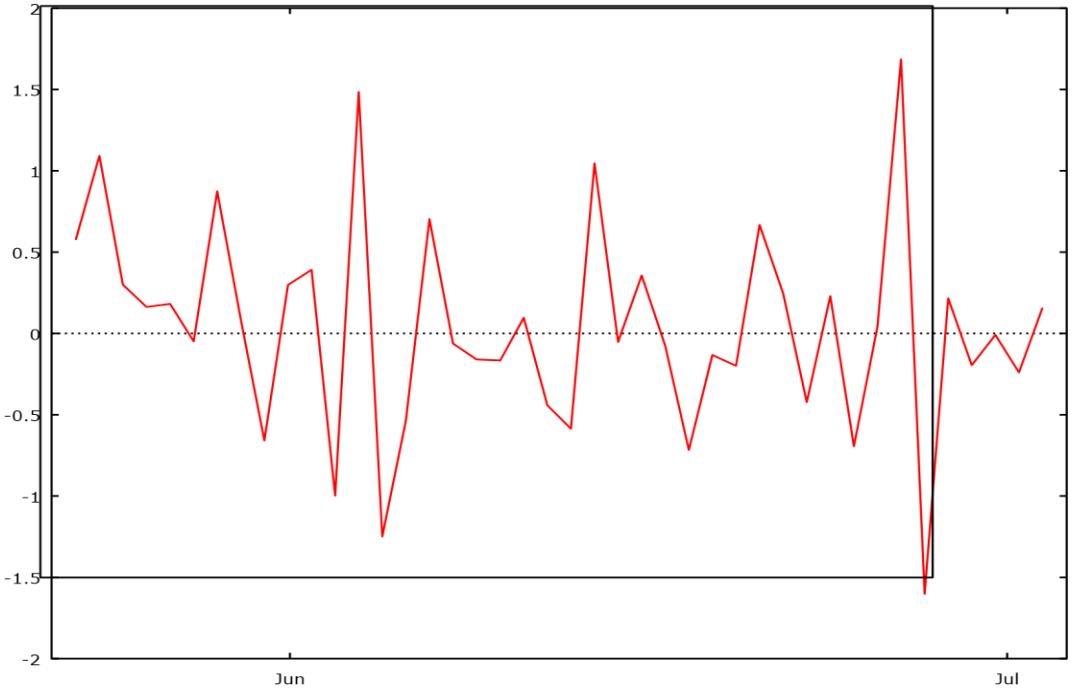

Figure 4. Time series Plot of inf in first difference

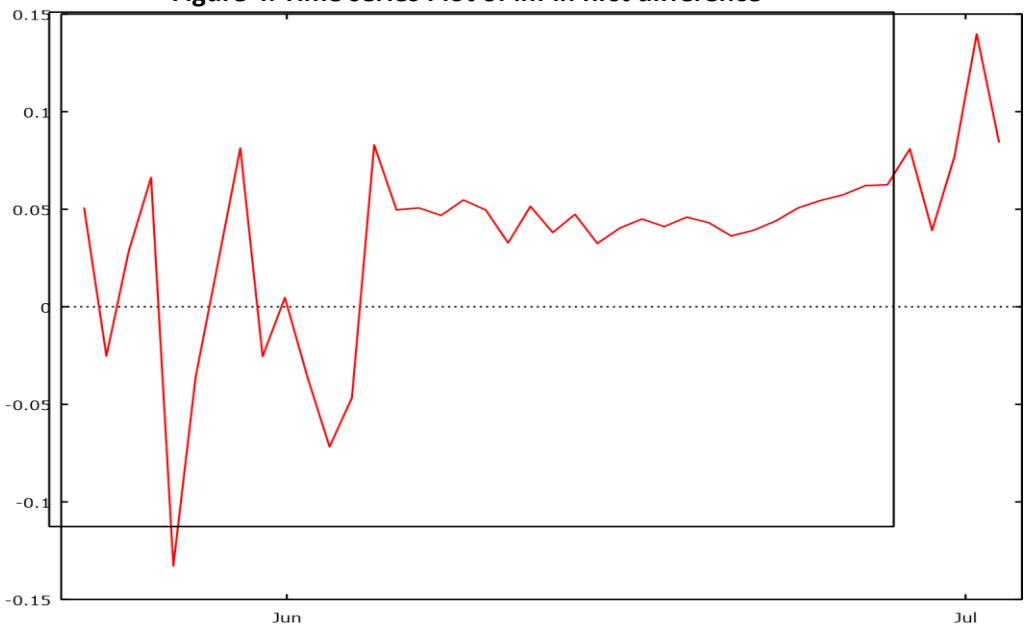

Figure 5. Time series Plot of gdp in first difference

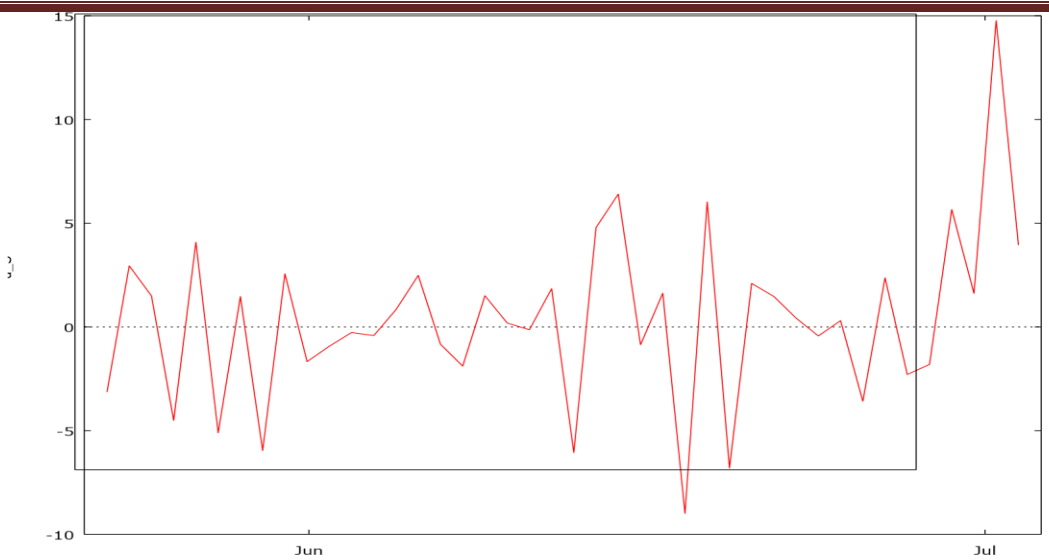

Figure 6. Time series Plot of S in first difference

4.2 The ADF/KPSS Test Results

The ADF test results are reported in Table 1 and Table 2. The results indicate that the series are unit root in levels (Table 1) but attained stationarity after first differencing (Table 2). The KPSS test is used as a confirmatory test to the ADF test. The KPSS test results are shown in Table 3 and Table 4. The results indicate that the series are unit root in levels (Table 3) but attained stationarity after first difference (Table 4). The results show that shocks to the variables have permanent effect and not temporary effect.

Table 1 ADF stationarity test results with a constant and trend

Variables	coefficients	t-statistics	ADF/P-Value	Results	Lag length
S	-0.228396	-0.955581	0.9482	Fail to reject H_o	9
lS	-0.544497	-3.49699	0.05269	Reject H_o	9
inf	-0.396	-2.727	0.226	Fail to reject H_o	9
lninf	-0.082	-1.112	0.926	Fail to reject H_o	9
gdp	0.120	4.571	1.000	Fail to reject H_o	9
lngdp	-0.114	-1.819	0.695	Fail to reject H_o	9

Source: Author's computation, 2015

Table 2 ADF stationarity test results with a constant and a time trend

Variables(1^{st} dif.)	Coefficients	t-statistics	ADF/P-Value	Results	Lag length
ΔS	-1.29386	-8.34207	1.232e-008	Reject H_o	9
ΔlS	-2.36172	-4.39743	0.002154	Reject H_o	9
Δinf	-0.345	-1.657	0.770	Reject H_o	9
Δlninf	-2.606	-4.426	0.002***	Reject H_o	9
Δgdp	-0.302	-0.931	0.951	Reject H_o	9
Δlngdp	-1.126	-2.729	0.225	Reject H_o	9

Source: Author's computation, 2015: Note: *** denotes significance at 1% level

Table 3 KPSS stationarity test results with a constant and a time trend

Variables (levels)	t-statistics/P-value	Results	Lag length
S	0.145121	Reject H_o	3
lS	0.137803	Reject H_o	3
inf	0.279	Reject H_o	3
lninf	0.272	Reject H_o	3
gdp	0.281	Reject H_o	3
lngdp	0.275	Reject H_o	3

(Source: Author's computation, 2015): Critical values at 10% (0.122), 5% (0.149) and 1% (0.212) significant levels

Table 4 KPSS stationarity test results with a constant and a time trend

Variable (first diff.)	**t-statistics**	**Results**	**Lag Length**
ΔS	0.0891228	Fail to reject the null hypothesis	3
ΔlS	0.0545803	Fail to reject the null hypothesis	3
Δinf	0.262	Reject Ho	3
Δlninf	0.089	Fail to reject the null hypothesis	3
Δgdp	0.184	Reject Ho	3
Δlngdp	0.055	Fail to reject the null hypothesis	3

(Source: Author's computation, 2015): Critical values at 10% (0.122), 5% (0.149) and 1% (0.212) significant levels

4.3 Regression Results

The OLS results were preliminary used to examine the correlation among the variables. The results as reported in Table 5 shows, the variables are correlated. There is significant negative link between inflation and savings and a significant positive association between income and savings. The results indicate that 1% increase in inflation and income, leads to about 12.1% decrease in savings and about 123.1% increase in savings respectively. The R^2 value shows that the estimated model do not perform well. The value indicates that the inflation and income explains only about 22.7% changes in savings.

Table 5. OLS Regression Results

Number of observations (N) = 41): Dependent variable: lnS				
	Coefficient	**Std. error**	**T-ratio**	**P-value**
Constant	-26.727	11.243	-2.377	0.0227 **
$lninf_{-2}$	-0.121	0.039	-3.047	0.0042 ***
$lngdp_{-2}$	1.231	0.489	2.511	0.0165 **
lnS_{-2}	0.134	0.170	0.7862	0.4367
Mean dependent var 1.877 S.D. dependent var 0.606 Sum squared resid 11.347 S.E. of regression 0.554 R-squared (R^2) 0.227 Adjusted R-squared 0.164 F(3, 37) 4.235 P-value(F) 0.011				
Log-likelihood -31.841 Akaike criterion 71.682 Schwarz criterion 78.537 Hannan-Quinn 74.178 rho 0.286 Durbin-Watson 1.391				

(Source: Author's computation, 2015)

Note *** and ** denotes significance at 1% and 5% levels

4.4a ARDL/ Bound Cointegration Test Results

The results reported in Table 6 indicate significant cointegration among the variables (savings, inflation, and income) in models 1 and 2, since the F-statistics values are greater than the critical values of the upper bounds at the 90%, 95%, and 99% levels of significance, which is an indication of cointegration among the series variables. The null assumption of no cointegration is rejected in models 1 and 2.

4.4b The Long Run Coefficients

The long-run determinant of relationship among the variables was estimated with savings as the dependent variable. The results as reported in Table 7 indicate that all the variables are not statistically significant determinants of savings. The results have the expected a priori theoretical signs of negative (for inflation) and positive (for income). The results indicate that 1% increase in inflation leads to about 37.2% decrease in savings. A unit increase in income leads to about 0.37e-8 in savings. Though the effect of income on savings is small, the effect is significant.

Table 6 Test for cointegration relationship

Critical bounds of the *F* -statistic: intercept and trend			
	90% level	95% level	99% level
	I(0) *I*(1) 2.915 3.695	*I*(0) *I*(1) 3.538 4.428	*I*(0) *I*(1) 5.155 6.265
Models	**Computed *F* -Stats**	**Decision**	
1. F_{gdp}(gdp|inf, s)	31.3247[0.000***]	Cointegrated	
2.F_{inf}(inf|inv, gdp)	14.7042[0.000***]	Cointegrated	
3. F_s(s|gdp, inf)	Not Available	Not Available	

(Source: Author's computation, 2015)

Critical values are obtained from Pesaran et al., (2001) and Narayan, (2004):

Note *** denotes significance at 1% level

Table 7 Estimated long-run coefficients. Dependent variable is= 's'. 41Observations used for estimation from 1972 to 2012

Variable	**Coefficient**	**Std. Error**	**T-ratio[P-value]**
Constant	-11.0078	4.1824	-2.6320[0.012**]
Trend	-0.77270	0.11862	-6.5140[0.000***]
gdp	0.3691E-8	0.6595E-9	5.5968[0.000***]
inf	-0.37242	0.097121	-3.8346[0.000***]
R-Squared	0.62543	R-Bar-Squared	0.59506

(Source: Author's computation, 2015)

Note: *** and ** denotes statistical significance at the 1% and 5% levels.ARDL (1) selected based on Akaike Information Criterion

4.5. The Diagnostic and Stability Tests Results

The diagnostic tests results are reported in Table 8. The model passed the Heteroscadasticity, normality tests indicating the variances are constant over time, and that the results are functional form distributed. The R^2 (0.625) and the adjusted R^2 (0.595) in Table 6 are indications of a very well behaved model. The coefficient indicates approximately 65.75% of the variations in fossil fuel consumption are attributed to the explanatory variable.

Both stability tests (CUSUM and CUSUMSQ) as shown in Figure 7 and 8 revealed that the estimates are stable whereas the variance is not stable since the residuals fall within the various 5% critical boundaries (Figure 7) whereas the squared residuals do not fall within the various 5% critical boundaries (Figure 8). The null assumptions are rejected in figure 7 but not in figure 8.

Table 8 Diagnostic Tests of ARDL Model

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1) = 2.1836[0.139]	F(1,36) = 2.0251[0.163]
B:Functional Form	CHSQ(1) = 8.5243[0.004]	F(1,36) = 9.4493[0.004]
C:Normality	CHSQ(2) = 1.2675[0.531]	Not applicable
D:Heteroscedasticity	CHSQ(1) = 3.1933[0.074]	F(1,39) =3.2941[0.077]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

Source: Author's computation, 2015

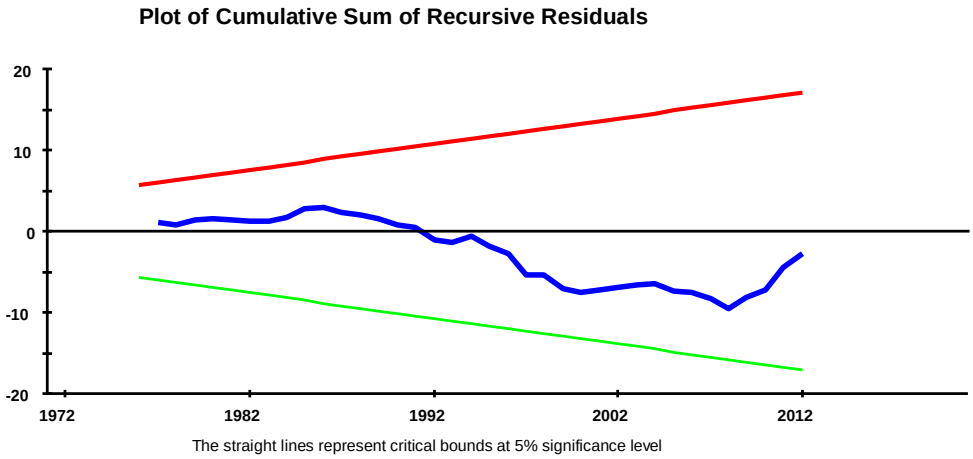

Figure 7. Plots of CUSUM

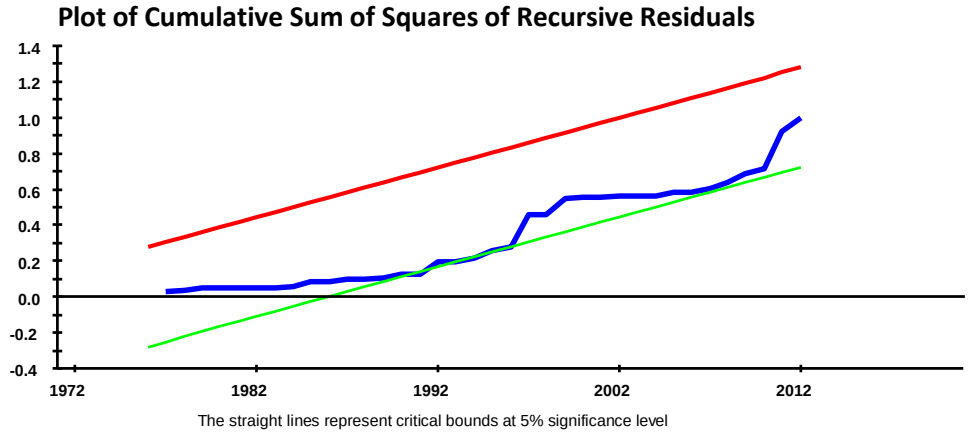

Figure 8. Plots of CUSUMSQ

5 Conclusions and Policy Implications

This paper investigated the association, cointegration, and long run link among inflation, savings, and income in Ghana for 1970-2012 periods, by using OLS and ARDL models. The results show that there is significant long run association among the variables. The findings are in line with the assumption underlying the paper.

The findings support orthodox macroeconomic theoretical contention that inflation negatively influences savings by reducing the returns on savings of consumers (Heer & Suessmuth, 2006; den Haan, 1990: Feldstein, 1982). The findings do not support the macroeconomic theoretical argument that inflation results in higher savings as a result of precautionary savings (Deaton, 1991). The neutrality hypothesis of the link between inflation and savings is also not supported by the current paper. The neutrality hypothesis explained that inflation has no significant effect on savings (Sidrauski, 1967; Stockman, 1981).

In addition, empirical findings reported by previous researchers (Mobin & Masih, 2014; Ahmad & Mahmood, 2013; Heer & Suessmuth, 2006) are supported. These researchers reported that inflation have significant negative influence on savings. The findings do not support the argument of positive effect of inflation on savings as reported by previous researchers (Loayza & Shankar, 2000).

The link between income and savings also support theoretical and empirical predictions of positive effects of inflation on savings (Farhan & Akram, 2011; Ozcan et al, 2003; Agrawal, 2001; Loayza & Shankar, 2000). The findings indicate the variables in the model could be relied on as policy variables to influence savings in the study area. The findings support the inflation targeting policies of the government. To increase savings and economic growth, policies intended to reduce inflation rates should be persued. Future studies should consider the issue of structural breaks and causality since the current study did not consider these issues. Other issues such as interest rate and savings should be considered.

References

Agrawal, P. (2001). “The relationship between savings and growth: cointegration and causality evidence from Asia”. *Applied Economics,* 33, 499-513.

Ahmad, K., & Mahmood, H. (2013). Macroeconomic Determinants of National Saving

Revisited: A Small Open Economy of Pakistan. *World Applied Sciences Journal,* 21(1), 49-57.

Athukorala, P. C., & Sen, K. (2003). “The determinants of private savings in India”. *World Development,* 32(3), 491-503.

Chaturvedi, V., Kumar, B., Dholakia R. H. (2008). Interrelationship between Economic Growth, Savings and Inflation in Asia, SSRN: http://dx.doi.org/10.2139/ssrn.1212096

Davidson, R., MacKinnon, J. G. (1982). Inflation and the Savings Rate. Queen’s Economics Department Working Paper No. 493.

Deaton, A. S. (1977). “Involuntary saving through unanticipated inflation”. *American Economic Review*, 67, 899-910.

Dickey, D.A. and Fuller, W.A., 1981. Distribution of the estimators for autoregressive time series with a unit root. *Econometrica*, 49, 1057-1072.

den Haan, W. J. (1990). The Optimal Inflation Path in a Sidrauski-Type Model with Un-certainty. *Journal of Monetary Economics*, 25, 389-409.

Er, H. P., Tugcu, C. T., & Coban, O. (2014). Investigating the link Between Savings, Inflation and Economic Growth: An ARDL Analysis for the case of Turkey. *Journal of Economics, Finance and Accounting*, 1(2), 81-90.

Feldstein, M. (1982) Inflation, Capital Taxation, and Monetary Policy, in: R.E. Hall (ed.), *Inflation: Cause and Effect*, Chicago, III., University of Chicago Press.

Farhan, M., & Akram, M. (2011). Does Income Level affect Saving Behaviour in Pakistan? An ARDL approach to co-integration for empirical assessment. *Far East Journal of Psychology and Business*, 3(3), 62-72.

Ghana Statistical Service (GSS, 2015). Consumer Price Index, *Newsletter.*www.statsghana.gov.gh. Retrieved on 20/5/2015.

Heer, B., & Suessmuth, B. (2006). The Savings-Inflation Puzzle. Cesifo Working Paper*,* No. 1645 (6).

Jump, G. V. (1980). "Interest rates, inflation expectations, and spurious elements in measured real income and savings". *American Economic Review*, 70, 990-1004.

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root. *Journal of Econometrics*, 54 (1), 159-178.

Loayza, N., & Shankar, R. (2000). "Private savings in India". *The World Bank EconomicReview*, 14(3), 571-94.

Loayza, N., Schemidt-Hebbel, K., & Serven, L. (2000). "Saving in developing countries: An overview". *The World Bank Economic Review,* 82(2), 165-181.

Mobin, A. M., & Masih, M. (2014). Do the macroeconomic variables have any impact on the Islamic bank deposits? An application of ARDL approach to the Malaysian market. MPRA Paper No. 62342: Available at Online at http://mpra.ub.uni-muenchen.de/62342/

Modigliani, F., & Shi, L. C. (2004). "The Chinese Saving Puzzle and the Life-Cycle Hypothesis". *Journal of Economic Literature*, 42:1 (March), 145-170.

Ozcan, K. M., Gunay, A., & Ertac, S. (2003). "Determinants of private savings behaviour in Turkey". *Applied Economics,* 35(12), 1405-1416.

Ofori, A., Adjei, M. K. R., & Yeboah, S. A. (2015). Modelling the Link between Inflation and Import in Ghana. *Journal of Empirical Economics*, 4(1), 49-62.

Pesaran M. H., & Shin Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis. *Cambridge University Press*.

Pesaran, H. M., Shin, Y., & Smith, R. J. (2001). "Bounds Testing Approaches to the Analysis of Long-Run Relationships". *Journal of Applied Econometrics*, 16, 289-326.

Sidrauski, M. (1967). Inflation and Economic Growth. *The Journal of Political Economy,* 75(6),796-810.

Siegel, J. J. (1979). "Inflation-induced distortions in government and private savings statistics". *Review of Economics and Statistics*, 61, 83-90.

Stockman, J. (1981). Anticipated inflation and the capital stock in a cash-in-advance economy. *Journal of Monetary Economics*, 8, 387-393.

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