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Is Inflation a Threat on Financial Sector Performance?

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Abstract
This study sought to assess the effect of inflation on financial sector performance by employing panel data from five Ghanaian banks with reference period from 2004 to 2013. Pooled, random effects and generalized method of moment (GMM) models were employed to estimate the effect of inflation on performance of the financial sector. The quadratic function was employed to estimate threshold beyond which it is detrimental to the performance of the financial sector. The study concludes that inflation in the Ghanaian economy will continue to have a positive effect on financial sector development unless it reaches a threshold of 15 percent. The study recommends a threshold level not above 15 percent of inflation to accelerate the development of the financial sector.
Keywords: inflation, performance, financial sector, panel data, Ghana

1. Introduction

1.1 Background

Inflation is defined "as the rate at which prices generally increases". Inflation is unwanted by any country and high inflation is considered to be one of the main macroeconomic challenges face by a country. Money supply is believed to be the main cause of inflation in every country in the globe. It is believed that managing inflation is one of the main facets of any economy. In recent times, one aspect of the economy of which every government and country has to deal with is inflation (Brealey *et al*. 2001). According to Milton (1992), "inflation is always and everywhere a monetary phenomenon". Most economists, irrespective of their position be it a monetarist or Keynesians, agree that proposition. The assertion made by Milton implies that persistent inflation has time immemorial been due to persistent growth in supply of money. He added that it is not caused by persistent velocity growth or negative growth in real income. It should be noted that increase in inflation does not in all cases mean failure of the economy but when the country fails to put up measures to mitigate the adverse effect of it. Every economy in the globe feels the adverse effect of inflation. Economists define inflation as a state in the economy of a country, when there is an incessant rise in the price of goods as well as services over a period of time. The resultant of this is that, when the general price level rises, each unit of currency buys fewer goods and services reflecting erosion in the purchasing power of capital and subsequently a loss of real value in the internal medium of exchange and unit of account in the economy (Kimani & Mutuku 2013).

The relationship between inflation and financial development has been a subject of intense debate among macroeconomists in recent years. According to Umar *et al.* (2014), the impact of inflation on the performance of banks is a crucial issue. Inflation is considered to be very important in designing programme with the aim of achieving greater efficiency by lenders, managers, investors as well as shareholders. The effects of inflation on the economy are diverse and can be both positive and negative. There is a threshold level of inflation below which inflation has a positive effect on financial depth, but above which the effect turns negative (Khan *et al*. 2001). Previously, a negative association between inflation and economic growth was widely developed (Barro 1995). Huybens & Smith (1998, 1999) argue that an increase in the rate of inflation could initially have negative consequences on financial sector performance through credit market frictions before affecting economic growth. Then, a positive relationship between the development of the financial system and economic growth took place in the economic literature (King and Levine 1993; Pagano 1993; Levine & Zervos 1996, 1998). Azariadis & Smith (1996) emphasize the importance of threshold level of inflation in the relationship between inflation and financial sector performance. The negative consequence of inflation on financial sector efficiency becomes effective once the rate of inflation exceeds some threshold. These models further suggest another threshold over which additional increase of inflation will have no damaging impact on financial sector performance (Boyd & Smith 1998; Huybens & Smith 1998, 1999).

1.2 Problem Statement

Some studies have found a positive relationship between inflation and financial development, a case in which higher permanent inflation leads to higher real economic activity or to super-neutrality, where higher inflation has no effect on real interest rates, or real activity (Mundell 1963; Tobin 1965; English 1999; Bittencourt 2011). According to English (1999), higher inflation rate encourages households to substitute purchased transaction services for money balances, thereby boosting the financial sector. In this way, inflation may have a positive impact on financial development.

The negative effects are however most pronounced and comprise a decrease in the real value of money as well as other monetary variables over time. As a result, uncertainty over future inflation rates may discourage investment and savings, and if inflation levels rise quickly, there may be shortages of goods as consumers begin to hoard out of anxiety that prices may increase in the future. According to Geetha *et al.* (2011), financial theorists believe that there are direct and indirect aftermaths of inflation in every sector of the economy ranging from exchange rates, investment, unemployment, interest rates, and stock markets among others. These researchers concluded that inflation and stock markets share a very close association, and hence, the rate of inflation influences stock market volatility and risk.

It is noted that for developing countries with high levels of reserve requirements, high rates of inflation can serve as a significant tax on banks (Boyd & Champ 2003). Inflation also creates uncertainty and financial market frictions, which make the financial system inefficient in allocating resources (Huybens & Smith 1998; 1999; Boyd & Smith 1998). Similar studies, such as De Gregorior & Guidotti (1995), have found that financial development significantly reduces economic growth for countries which experienced relatively high inflation rates in Latin America during the 1970s and the 1980s. This has led to the World Banks' Operating Directive on the financial sector to recommend developing countries not to pursue financial reforms unless their inflation rates are sufficiently low. Although studies have revealed a negative effect of inflation on financial performance in developing countries, majority of the studies done in Ghana (Frimpong & Oteng 2010; Quartey 2010; Marbuah 2010) have geared towards assessing the impact of inflation rate and inflation threshold on the rate of economic growth in Ghana. There is still little information and literature on the effect of inflation on financial performance in Ghana.

1.3 Research Objectives

1. To estimate the effect of inflation on the performance of the financial sector in Ghana.
2. To estimate the threshold beyond which inflation is harmful to the performance of the financial sector in Ghana.
3. To assess the trend of inflation over the period 1960-2013.

1.4 Relevance of the Study

This study would provide insights into the effect of inflation of the performance of the financial sector, the threshold effect of inflation, the trend of inflation over the past years and also to suggest policy options to mitigate the effect of the inflation and it threshold. It would also explore how other factors other than inflation influence the financial sector performance. This study will add to existing literature and it will also serve as a bench mark for researchers who want to assess the factors that influence either economic growth and/ or performance of the financial sector in Ghana and beyond.

2. Literature Review

2.1 Effect of Inflation on Bank Performance

Several literature have empirically examined the relationship between financial performance and inflation. According to Huybens & Smith (1999), when inflation rate rise in an economy, performance of banks and their lending reduces. In the long run it has a negative repercussion on trading volume of market equity. Boyd *et al*. (2001) found that the relationship between banking sector and inflation was significant, negative and non-linear. They affirmed the fact that the lending activities of banks decreases as a result of a unit increase in inflation. This has adverse effect on the performance of the financial sector. They also argued that prior to threshold level of inflation, the activities of lending by banks diminishes. The repercussion of the above assertion is the ineffective and inefficient allocation of resources in the financial sector. Ghazouani (2004) did a cross-country analysis on the relationship between inflation and the performance of the financial sector. The empirical result shows that financial sector performance is negatively affected by inflation. It was also revealed that after the author controlled simultaneity bias evidence of threshold level was not found. Notwithstanding, the study was able to establish that "a marginal increase in inflation is harmless to stock market performance and banking sector development whatever the rate of inflation." It was also emphasized that high inflation rate decreases return on financial asset. When this happens, the credit market becomes prone to friction, and hence, this influences the loan advancing by the banks negatively. Rahman & Serletis (2009) undertook a study to assess the influence of uncertainty about inflation on real activities that take place in the economy. They employed data from four industrialized economies. Their obtained result showed that effect of inflation is different in different economies. They said that impact of inflation is dependent on the financial structure of the economy. A model was developed by English (1999) to assess the nature of relationship between inflation and the financial services of a country. Cross-sectional data was used for the analysis. He obtained a result which shows that rate of inflation has an inverse relationship with the financial performance in the country. Bittencourt (2010) made an assertion from a study he undertook through the employment of panel and time series approaches. The study found that inflation is harmful to performance of the

financial sector. He concluded that although inflation is harmful to the economy, low level is needed for achieving a sustainable and profound financial sector. He added that market-based financial system is more prone to the effect of inflation that bank-based financial system. Namazi & Salehi (2010) opine that there is a direct relationship between diminish absorbed deposit and loan given volumes of banks and inflation. This indicates that any rise in inflation will cause a decline in the performance of the banking system. Several studies have reported a negative relationship amongst inflation and financial performance in an economy.

Notwithstanding, some literature also report otherwise. Guru *et al.* (2012) opine that increase in inflation motivate increase in bank performance and profitability. In the same vein, there is a negative correlation amongst interest rate and profitability of banks. Tan & Floros (2012) perform an assessment on the impact of inflation on the profitability of banks, the result shows that "there is a positive correlation between bank profitability, cost efficiency, banking sector development, stock market development and inflation in China". Angeloni & Faina (2013) also report that "monetary expansion and positive productivity shock increases bank leverage and risk". The differing results of the authors indicate that the relationship between inflation and performance of the financial sector is both negative and positive. Nonetheless, it can be ascertained that more authors reported a negative correlation.

2.2 Relationship between Inflation and Financial development

Several authors report a negative effect of inflation on financial development while other researchers hold a contrary view. Cooley & Hansen (1989) and De Gregorio (1993) assert that when inflation level is high, it causes reduction in labour supply which then impedes the growth of the economy. According to Shahbaz *et al.* (2010), investment and capital accumulation are also affected negatively by inflation, hence, lead to the destruction of the distribution of income in the economy. Haslag & Koo (1999) state that theoretically, financial development is negatively affected by high levels of inflation. A study done by Bittencourt (2007, 2011) employed both time series and panel data. The empirical result showed that because of poor macroeconomic performance, development of the financial sector is affected positively by high inflation level. Murombedzi (2008) revealed that financial institutions are damaged by high inflation through troubling ways. It was also found out that there is a non-linear relationship between inflation and financial sector growth. Boyd et al. (2001) also reported that inflation has a negative effect on financial development but the effect is small. Naceur & Ghazouani (2007) using the generalized method of moment (GMM) estimation method showed that increase in inflation causes financial development to decline when the inflation exceeds threshold point.

Kim *et al.* (2010) investigate long-and-short runs effect of inflation on financial development using Pooled Mean Group estimator developed by Pesaran *et al.* (1999) for 87 countries over the period of 1965-2005. Their empirical results show that there is a negative relationship between inflation and financial development in long run but positive effect in short run. Demirguc-Kunt & Maksimovic (1998) empirically opine that frictions in the financial market can cause a positive influence of inflation on financial crisis. According to Mundell (1963) and Tobin (1965), because of low return on capital, inflation has an effect on the allocations of portfolio which leads to improvement in the investment activities in the economy and this cause growth. English (1999) also added that people are made to replace purchasing of transactions services for money balances. This stimulates the increase in financial supply and the long run encourages financial development in the economy. The assertion of English is an indication of positive relationship between financial development and inflation.

3. Methodology

3.1 Data and Sampling Criteria

This study employed secondary data which were mainly annual accounting data of individual banks and macroeconomic data drawn for the period 2004-2013. Data set was constructed in a manner aimed at assessing whether inflation poses a threat on financial sector performance. The empirical analysis and estimation was based on the use of panel data analysis. The data needed for this study was sourced from the Ghana Banking Survey (GBS) by PricewaterhouseCoopers in collaboration with Ghana Association of Bankers, the Bank of Ghana Annual Report and World Development Indicators (WDI). All universal banks existing in the banking industry from 2004 to 2013 were sampled. The sampling criteria yielded a balanced dataset of five (5) Ghanaian banks. This ensures that all entities are represented in the sample.

3.2 Method of Data Analysis

3.2.1 Stationarity and Unit Root Test

The rationale behind the performance of unit root test is that if we use the data without checking their stationarity properties, the results derived from the regression models would produce the so called spurious results (Datta & Kumar, 2011). Before estimating our modified model in the equation (6) it was very important to test out stochastic properties of the variables to be estimated. Usually, this task is realised by performing unit root test. However, one of the weaknesses of unit root test is related to small number of observations and that a minimum number of 20

observations are required so as to get reliable results which can be made inference (Gujarati, 2004; Gujarati & Porter, 2009). The analysis was done using the Dickey-Fuller (DF) or more convenient ADF that is Augmented Dickey-Fuller and Phillips-Perron unit root test. The study proceeded with the estimation of the model in equation (6). The null hypothesis for the two tests was unit root or the time series was non-stationary (i.e. δ = 0) while the alternative hypothesis states that there is no unit root or the time series was stationary (i.e≠ 0.).
The general form of DF and ADF is estimated by using the following models:

$$Y_t = \gamma Y_{t-1} + \varepsilon_t \quad (1)$$

If $\gamma = 1$ then equation (1) becomes a random walk, that is non-stationary process. As a result of this there tends to be the so called unit root problem which means there is a situation of non-stationarity in the series. However, if $\gamma < 1$, this means that the series Y_t is stationary. However, the unit root problem can be eliminated or stationarity can be achieved by differencing the data set (Wei 2006). The basic idea behind the ADF unit root test for non-stationarity is to simply regress Y_t on its (one period) lagged value Y_{t-1} and find out if the estimated γ is statistically equal to one or not. In this case, equation (1) can be further manipulated by subtracting Y_{t-1} from both sides and obtain:

$$Y_t - Y_{t-1} = (\gamma - 1)Y_{t-1} + \varepsilon_t \quad (2)$$

Equation (2) can be re-written as follows:

$$\Delta Y_t = \delta Y_{t-i} + \varepsilon_t \quad (3)$$

Where $\delta = (\gamma - 1)$, and Δ is the difference operator. Practically, instead of estimating equation (1), the study estimated equation (3) and tested for the null hypothesis of $\delta = 0$ against the alternative hypothesis of $\delta \neq 0$. If $\delta = 0$, then $\gamma = 1$ which means that there is a unit root problem and the series under consideration is non-stationary. The decision to accept or not to accept the null hypothesis of $\delta = 0$ was based on the Dickey-Fuller critical values of the $|\tau|$ tau statistic. The ADF test tends to include the lags of the first difference in the regression equation so as to make the error term ε_t white noise and thus, the testing procedure for the ADF unit root test is applied to the following model:

$$\Delta y_t = \alpha_0 + \alpha_1 t + \gamma y_{t-1} + \sum_{j=1}^{p} \delta_j \Delta y_{t-1} + \varepsilon_t \quad (4)$$

From equation (4), α_0 is a constant, α_1 the coefficient on a time trend series, γ the coefficient of y_{t-1} which measures the unit root, ρ is the lag order of the autoregressive process, δ_j Is a measure of lag length, $\Delta y_t = y_t - y_{t-1}$ are first difference of y_t, y_{t-1} are lagged values of order one of y_t, Δy_{t-j} are changes in lagged values, and ε_{it} is the white noise (Ssekuma 2011).
In testing the unit root, ADF was employed instead of DF test because the ADF took care of possible serial correlation in the error terms by including the lagged difference of the dependent variable. Moreover, Phillips-Perron was used to test for the presence of unit root because it also takes care of serial correlation in the error terms by using the non-parametric statistical method without addition of lagged difference terms (Hussain 2011). The Phillip-Perron test is based on the following model:

$$\Delta y_t = \vartheta + \beta(t - T/2) + (\rho - 1)y_{t-1} + \chi \Delta y_{t-1} + \varepsilon_t \quad (5)$$

3.2.2 Estimating the Effect of Inflation on Financial Performance
This objective was achieved through the use of a panel data analysis. According to Greene (2003), panel data are commonly used because it has the advantage of giving more information as it consists of both the cross sectional information, which captures individual variability, and the time series information, which captures dynamic adjustment. The panel data model can be estimated with either the fixed effect model, random effect model or the constant coefficient effects model. But with regards to this work, the fixed and the random effect were used in other to check the robustness of the results.
3.2.2.1 Model specification
A standard linear specification of a panel data can be written as

$$FSP_{it} = \beta_i + \sum_{j=2}^{k} \beta_j X_{jit} + \sum_{p=1}^{n} \gamma_{pi} Z_{Pi} + \delta_t + \varepsilon_{it} \quad (6)$$

Where FSP_{it} is the dependent variable for bank *i* at time *t*. X_j variables are observed explanatory variables (internal and external determinants of financial performance), Z_p variables are unobserved explanatory variables. The index

i refer to the unit of observation, *t* refers to the time period, and *j* and *p* are used to differentiate between different observed and unobserved explanatory variables. ε_{it} is a disturbance term assumed to satisfy the usual regression model conditions ($\varepsilon_{it}'s$ are independently and identically distributed normal random variable). A trend term δ_t has been introduced to allow for a shift of the intercept over time. If the implicit assumption of a constant rate of change seems too strong, the trend can be replaced by a set of dummy variables, one for each time period except the reference period (Dougherty 2006).

Because z_p variables are unobserved, there is no means of obtaining information about the component $\sum_{p=1}^{n} \gamma_{pi} Z_{Pi}$ of the model and it is convenient to rewrite equation 6 as

$$FSP_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \alpha_i + \delta_t + \varepsilon_{it} \quad (7)$$

Where α_i is the same as $\sum_{p=1}^{n} \gamma_{pi} Z_{Pi}$ which is known as the unobserved effect, represents the joint impact of the Z_{Pi} on FSP_{it}

We therefore estimate equation (7) with fixed effects, where it is assumed that differences in the characteristics of the banks are taken into account by differences in the constant (intercept). We therefore transform and re-write equation (7) as:

$$FSP_{it} = \cup_{\alpha i} + \sum_{j=2}^{k} \beta_j X_{jit} + \delta_t + \varepsilon_{it} \quad (8)$$

Where $\cup_{\alpha i}$captures the differences in the constant term of the corresponding banks. Equation (8) can further be decomposed in equation (9) as

$$FSP_{it} = \cup_{\alpha i} + \sum_{j=1}^{m} \beta_j^1 F_{jit} + \sum_{j=1}^{n} \beta_j^2 G_{jit} + \delta_t + \varepsilon_{it} \quad (9)$$

Where $\sum_{j=1}^{m} \beta_j^1 F_{jit}$ denotes the internal determinants of financial performance and $\sum_{j=1}^{m} \beta_j^1 F_{jit} + \sum_{j=1}^{n} \beta_j^2 G_{jit}$ as the external determinants of financial performance

$\sum_{j=2}^{k} \beta_j X_{jit}$ is equal to $\sum_{j=1}^{m} \beta_j^1 F_{jit} + \sum_{j=1}^{n} \beta_j^2 G_{jit}$

Both the fixed effect and the random effect are improved versions of the Ordinary Least Squares. In this study, the random effect was employed in the study based on the Hausman test (Baltagi 2001).

The statistical package (Stata 13.0) was used to implement the tests, estimate the models, and to determine the actual degrees of freedom. If the test statistic (Prob>F=0.0000) is less than 0.05, leading to the rejection of the null hypothesis and acceptance of the alternative: fixed effect is preferred and appropriate model.

3.2.2.2 Empirical Model Specification

$$\mathrm{ROE_{it}} = \alpha_i + \beta_1^1 \mathrm{L_{it}} + \beta_2^1 \mathrm{AQ_{it}} + \beta_3^1 \mathrm{NBS_{it}} + \beta_4^1 \mathrm{OE_{it}} + \beta_1^2 \mathrm{NMS_{it}} + \beta_2^2 \mathrm{GDP_{it}} + \beta_3^2 \mathrm{INF_{it}} \quad (10)$$

$$\mathrm{ROA_{it}} = \alpha_i + \beta_1^1 \mathrm{L_{it}} + \beta_2^1 \mathrm{AQ_{it}} + \beta_3^1 \mathrm{NBS_{it}} + \beta_4^1 \mathrm{OE_{it}} + \beta_1^2 \mathrm{NMS_{it}} + \beta_2^2 \mathrm{GDP_{it}} + \beta_3^2 \mathrm{INF_{it}} \quad (11)$$

The test statistics for each of the null hypothesis is as follows:

$T = \frac{\beta_j^1}{\mathrm{Se}(\beta_j^1)} \approx t_{\frac{\alpha}{2}}, n-k$ and $T = \frac{\beta_j^2}{\mathrm{Se}(\beta_j^2)} \approx t_{\frac{\alpha}{2}}, n-k$ for both endogenous and exogenous respectively. (Where *n-k* is the degrees of freedom). Thus, the null hypothesis follows a T distribution where $\mathrm{Se}(\beta_j^1)$ and $\mathrm{Se}(\beta_j^2)$are the standard errors of β_j^1 and β_j^2 respectively. If $T > t_{\frac{\alpha}{2}}, n-k$ the null hypothesis is rejected and the alternative is accepted that the parameter estimate is significant at 5% significance level in determining the relationship that exist between financial performance and inflation. Otherwise we accept the null hypothesis that the driver is not significant.

3.2.2.3 Description of Variables

The variables that were used to achieve the objectives are summarized in the table below with their measurement and expected sign according to the various literature that has been reviewed.

Table 1: description of variables

Variable	description	Measurement	A-priori expectation
		Internal determinants	
X_1	Liquidity	Ratio of Banks advances to customer deposits	+/-
X_2	Asset quality	Ratio of bad debt to bank advances	+/-
X_3	Bank size	Total asset as a proxy	+
X_4	Operating Efficiency	Cost to income ratio	-
		External determinants	
X_5	Money supply	Amount of stock of money available in the economy	+/-
X_6	GDP	Total goods and services in the economy	+
X_7	Inflation	Annual inflation rate (percent)	+/-

3.2.3 Estimating the threshold beyond which inflation is harmful to the performance of financial sector in Ghana

This study followed a model used by Checherita & Rother (2010) to estimate a threshold of public debt through panel data fixed effect analysis over a 40 year period. Apere (2014) also applied same model to explore the impact of public debt on private investment in Nigeria through a time series analysis.

The empirical model is specified as;

$$tp = -\frac{\rho}{2\delta} \quad (12)$$

Where tp stands for turning point of inflation, ρ is the coefficient on the linear term and δ signifies coefficient in the quadratic term (Apere, 2014).

3.2.4 To assess the Trend of Inflation over the period 1960-2013

The trend and pattern of inflation was estimated using the linear function**.** The linear trend equation can be specified as follows;

$$Y' = \alpha + \beta T \quad (13)$$

Where:

Y' , signifies the projected value of the Y variable for a selected value of T. α , signifies the Y-intercept. It is the estimated value of Y when $T = 0$. It can also be interpreted as the estimated value of Y where the line crosses the Y-axis when T is zero. β Signifies the slope of the line, or the average change in Y' for each change of one unit in T. T Signifies any value of time that is selected. For this study it is from 1960 to 2013.

4. Results and Discussions

4.1 Stationarity Test Results

Table 2 presents the result of the stationarity and unit root test. From the analysis of the unit roots, if the series were observed to be integrated of order one – $I(1)$, it will imply that they must be modelled in first difference ($\Delta yt = yt - yt - 1$) to render them stationary. A time series is said to be stationary if it does not vary overtime, which implies that its values have constant variability. All the variables (ROE, ROA, inflation, GDP, operating expenses, money supply, liquidity, asset quality, and bank size) included in the model were stationary at level (I(0)) and were statistically significant at 1% (P<0.01).

Table 2: Augmented Dickey Fuller and Philip Perron unit root tests

Variable	Measures	ADF		Phillips-Perron	
		Statistic	*P-value*	*Statistic*	*P-value*
ROA	Inverse chi-squared (10)	50.535	0.0000	94.596	0.0000
	Inverse normal	-3.716	0.0001	-5.122	0.0000
	Inverse logit t(29)	-5.373	0.0000	-10.724	0.0000
	Modified inv. Chi-squared	9.064	0.0000	18.916	0.0000
ROE	Inverse chi-squared (10)	64.429	0.0000	89.898	0.0000
	Inverse normal	-5.976	0.0000	-7.113	0.0000
	Inverse logit t(29)	-8.004	0.0000	-11.186	0.0000
	Modified inv. Chi-squared	12.170	0.0000	17.866	0.0000
Liquidity	Inverse chi-squared (10)	54.374	0.0000	24.109	0.0073
	Inverse normal	-4.996	0.0000	-2.790	0.0026
	Inverse logit t(29)	-6.590	0.0000	-2.796	0.0045
	Modified inv. Chi-squared	9.922	0.0000	3.155	0.0008
Asset Quality	Inverse chi-squared (10)	112.873	0.0000	112.873	0.0000
	Inverse normal	-6.648	0.0000	-6.648	0.0000
	Inverse logit t(29)	-13.309	0.0000	-13.309	0.0000
	Modified inv. Chi-squared	23.003	0.0000	23.003	0.0000
Bank Size	Inverse chi-squared (10)	289.827	0.0000	35.992	0.0001
	Inverse normal	-14.636	0.0000	-3.903	0.0000
	Inverse logit t(29)	-36.256	0.0000	-4.289	0.0001
	Modified inv. Chi-squared	62.571	0.0000	5.812	0.0000
Money Supply	Inverse chi-squared (10)	36.088	0.0001	33.554	0.0002
	Inverse normal	-4.306	0.0000	-4.055	0.0000
	Inverse logit t(29)	-4.496	0.0001	-4.168	0.0001
	Modified inv. Chi-squared	5.833	0.0000	5.267	0.0000
Inflation	Inverse chi-squared (10)	28.497	0.0015	29.512	0.0000
	Inverse normal	-3.517	0.0002	-4.293	0.0000
	Inverse logit t(29)	-3.503	0.0008	-4.053	0.0000
	Modified inv. Chi-squared	4.136	0.0000	5.662	0.0000
Operation Expenses	Inverse chi-squared (10)	65.634	0.0000	65.634	0.0000
	Inverse normal	-4.756	0.0000	-4.756	0.0000
	Inverse logit t(29)	-7.968	0.0000	-7.968	0.0000
	Modified inv. Chi-squared	12.440	0.0000	12.440	0.0000
GDP	Inverse chi-squared (10)			27.494	0.0022
	Inverse normal			-3.404	0.0003
	Inverse logit t(29)			-3.369	0.0011
	Modified inv. Chi-squared			3.912	0.0000

4.2 Multicollinearity Test

The VIF result is presented in Table 3. The Variance Inflation Factor (VIF) approach was employed to test whether the regressors in the model were highly correlated. The empirical result indicates that none of the regressors were highly correlated. This is because neither the mean VIF nor any of the respective VIF of the regressors is greater than 10.

Table 3: Multicollinearity Test

Variable	VIF	1/VIF
Bank size	5.55	0.180
Money supply	4.31	0.232
Liquidity	2.40	0.417
GDP	1.95	0.512
Inflation	1.72	0.581
Asset Quality	1.11	0.898
Operating Efficiency	1.08	0.924
Mean VIF	2.59	

4.3 Estimating the Effect of Inflation of Bank's Performance

Tables 4 and 5 present the result of the estimation of the effect of inflation on performance of banks. The traditional (Pooled), GMM and Random effects models were employed for the estimation. The performance measures used were Return on Equity (ROE) and Return on Asset (ROA).

Table 4 reveals that Pseudo R^2 is 0.516 and 0.847 which implies that 51.6% and 84.7% of the variation in the dependent variable (ROA) is jointly explained by the independent variables in the pooled and random effects models respectively. Prob>F of 0.002 which was statistically significant at 1% (P<0.01) significance level shows that the pooled model specified best fits the analysis. The Hausman test showed that the random effects model is the better model for analysis, since the probability *(0.9466)* value of the Hausman test was not statistically significant (1%, 5%, 10%) at any significance level. The sargan test was used to test the over identifying restrictions in the GMM model. Since the test was not statistically significant (P>0.5), the null hypothesis was not rejected. This implies that the over identifying restrictions in the GMM model specified for this study are valid. The Breusch Pagan Lagrangian Multiplier test was used to test which of the two models (pooled and random effects) was better for the analysis. Since the Prob>Chibar2 was 0.000, the study chose the REM over the pooled.

Table 4: Effect of Inflation on Performance (ROA)

Variables	Pooled		Random Effects		GMM	
	Coef. (Robust)	P-value	Coef. (Robust)	P-value	Coef. (Robust)	P-value
Liquidity	0.089	0.300	0.089**	0.039	0.195*	0.052
Asset Quality	0.311*	0.075	0.311***	0.008	0.733	0.295
GDP	0.008*	0.062	0.0079*	0.061	0.0059**	0.013
Inflation	-0.006**	0.025	-0.006***	0.000	-0.004**	0.019
Operation Efficiency	-0.008	0.157	-0.008*	0.083	-0.022	0.781
Bank Size	0.007	0.189	0.007*	0.099	0.229***	0.001
Money Supply (M2)	-0.015	0.71	-0.015	0.282	-0.240***	0.002
Constant	0.512***	0.000	0.512***	0.000	1.990***	0.000
Diagnostics						
R-squared	0.516		0.847			
F(7,40)[Prob>F]	(12.66)[0.002]					
Hausman[Prob>F]			[0.9466]			
Sargan test(Pvalue)					(0.827)	
Breusch Pagan LM Test	Chibar2 (01) [Prob>Chibar2]	2165.20 [0.000]				

*NB: *, ** and *** denotes 10%, 5% and 1% significant levels respectively*

From the random effects model analysis, liquidity, asset quality, GDP, inflation, operating efficiency, and bank size were statistically significant (either at 1%, 5% or 10%). The result on liquidity corroborates with Bourke (1989), and Kosmidou *et al.* (2008) who report that there is a positive relationship between liquidity and performance (ROA) of banks. Asset quality had a positive influence on performance (ROA). The result agrees with Kosmidou *et al.* (2008) who report that asset quality has a positive effect on performance (ROA). GDP had a positive and statistically significant influence on performance (ROA). Bikker & Hu (2002) assert that there is a positive association between economic growth and financial sector productivity which will then positively affect banks performance. Inflation had a negative and statistically significant influence on banks performance (ROA). Staikouras & Wood (2003) and Perry (1992) reported that unanticipated inflation has a negative influence on

economic growth as well as banks performance. Operating efficiency had a negative and statistically significant influence on banks performance (ROA). The result corroborates with (Kosmidou *et al.* 2008). Bank size had a positive and statistically significant influence on banks performance (ROA). The empirical result corroborates with Bikker & Hu (2002) and Goddard *et al.*(2004) who reported that bank size positively influence banks performance (ROA).

From the GMM model analysis, liquidity, GDP, inflation, bank size and money supply were statistically significant (either at 1%, 5% or 10%). Liquidity was statistically significant and positively influences banks performance (ROA). The empirical result agrees with Kosmidou *et al.* (2008) who report that there is a positive relationship between liquidity and performance (ROA) of banks. GDP had a positive and statistically significant influence on performance (ROA). The result agrees with Bikker & Hu (2002) who said there is a positive relationship amongst GDP and banks performance (ROA). Inflation had a negative and statistically significant influence on banks performance (ROA). The result is in line with the findings of Staikouras & Wood (2003) who report that unanticipated inflation has a negative influence on economic growth as well as banks performance. Bank size had a positive and statistically significant influence on banks performance (ROA). The empirical results agrees with Goddard *et al.* (2004) who report that bank size positively influence banks performance (ROA). Money supply had a negative and statistically significant influence on banks performance (ROA). The empirical result agrees with Badaruddin & Ariff (2009) who concluded that in a highly concentrated banking industry, money supply and bank performance are negatively related.

Table 5 reveals that Pseudo R^2 is 0.424 and 0.879 which implies that 42.4% and 87.9% of the variation in the dependent variable (ROA) is jointly explained by the independent variables in the pooled and random effects models respectively. Prob>F of 0.000 which was statistically significant at 1% (P<0.01) significance level shows that the pooled model specified best fits the analysis. The Hausman test showed that the random effects model is the better model for analysis, since the probability *(0.446)* value of the Hausman test was not statistically significant (1%, 5%, 10%) at any significance level. The sargan test was used to test the over identifying restrictions in the GMM model. Since the test was not statistically significant (P>0.5), the null hypothesis was not rejected. This implies that the over identifying restrictions in the GMM model specified for this study are valid. The Breusch Pagan Lagrangian Multiplier test was used to test which of the two models (pooled and random effects) was better for the analysis. Since the Prob>Chibar2 was 0.000, the study chose the REM over the pooled.

Table 5: Effect of Inflation on Performance (ROE)

Variables	Pooled		Random Effects		GMM	
	Coef. (Robust)	P-value	Coef. (Robust)	P-value	Coef. (Robust)	P-value
Liquidity	0.040	0.822	0.040	0.821	0.680**	0.051
Asset Quality	2.524**	0.041	2.524**	0.008	1.018***	0.010
GDP	0.024*	0.098	0.024*	0.094	0.015	0.327
Inflation	-0.027**	0.023	-0.028**	0.013	-0.005*	0.093
Operation Efficiency	-0.108***	0.000	-0.108**	0.015	-0.229	0.224
Bank Size	0.042**	0.017	0.042*	0.087	0.344***	0.007
Money Supply (M2)	-0.148**	0.040	-0.148**	0.042	-0.253	0.281
Constant	1.221*	0.077	1.221***	0.008	0.633***	0.000
Diagnostics						
R-squared	0.424		0.879			
F(7,40)[Prob>F]	(10.13)[0.000]					
Hausman[Prob>F]			[0.446]			
Sargan test (P value)					(0.601)	
Breusch Pagan LM Test	Chibar2 (01) [Prob> Chibar2]	3126.90 [0.000]				

*NB: *, ** and *** denotes 10%, 5% and 1% significant levels respectively*

From the random effect model, asset quality, GDP, inflation, operating efficiency, bank size, and money supply were statistically significant. Asset quality had a positive influence on performance (ROE). The result agrees with Kosmidou *et al.* (2008) who report that asset quality has a positive effect on performance (ROE). GDP had a positive influence on performance (ROE). The result agrees with Bikker & Hu (2002) who said there is a positive relationship amongst GDP and banks performance (ROE). Inflation had a negative influence on ROE. The result corroborates with Staikouras & Wood (2003) who report that unanticipated inflation has a negative influence on as well as banks performance. Operating efficiency had a negative influence on banks performance (ROE). The result agrees with (Kosmidou *et al.* 2008). Bank size had a positive influence on banks performance (ROE). The empirical result agrees with Goddard *et al.* (2004) who report that bank size positively influence banks performance (ROE). Money supply had a negative influence on banks performance (ROA). The empirical result agrees with Badaruddin & Ariff (2009) who report that money supply has a negative influence on banks

performance.

From the GMM model, liquidity, asset quality, inflation, and bank size were statistically significant. Liquidity had a positive relationship with banks performance (ROE). The empirical result agrees with Kosmidou *et al.* (2008) who report that there is a positive relationship between liquidity and performance (ROE) of banks. Asset quality had a positive influence on performance (ROE). The result agrees with Kosmidou *et al*. (2008) who report that asset quality has a positive effect on performance (ROE). Inflation had a negative influence on ROE. The result corroborates with Staikouras & Wood (2003) who report that unanticipated inflation has a negative influence on as well as banks performance. Bank size had a positive influence on banks performance (ROE). The empirical result agrees with Goddard *et al.* (2004) who report that bank size positively influence banks performance (ROE).

4.3.1 Testing the long run Causality amongst Inflation and Performance

The pairwise Granger causality test was employed to validate the econometric analysis whether or not inflation granger cause banks performance and vice versa. Table 6 presents the result of the test. The null hypothesis states that inflation and ROA/ROE does not granger cause each other whilst the alternative states otherwise. It can be inferred from Table 6 that inflation and ROE/ROA granger cause each other (there is bi-directional causality amongst ROE and inflation as well as ROA and inflation). This is due to the fact that F-statistic for all the tests was statistically significant. This result validates the econometric estimations which were found that inflation has statistically significant influence on performance.

Table 6: Pairwise Granger Causality Test

Hypothesis	F-statistic	Prob
ROA		
Inflation does not granger cause ROA	3.678	0.018
ROA does not granger cause Inflation	4.253	0.001
ROE		
Inflation does not granger cause ROE	5.033	0.000
ROE does not granger cause Inflation	3.051	0.022

4.4 Estimating Threshold beyond which Inflation is Harmful to the Performance of the Banks in Ghana

The turning point for the public debt is presented in Table 7. The turning point on banks performance is 15%. This implies that 1% increase in inflation will cause increase in performance of banks (ROE*ROA) until inflation reaches a threshold of 15%. The empirical result is in line with the findings of Naceur & Ghazouani (2007) who used the generalized method of moment (GMM) estimation method to show that increase in inflation causes financial development to decline when the inflation exceeds threshold point. The result also agrees with Murombedzi (2008) who revealed that financial institutions are damaged by high inflation through troubling ways and also found out that there is a non-linear relationship between inflation and financial sector growth at 15%. The empirical result is inconsistent with Khan *et al.* (2006) who reported that the threshold beyond which inflation is detrimental to financial development is not 15% but 3-6%.

Table 7: GMM Estimates of Turning point of Inflation

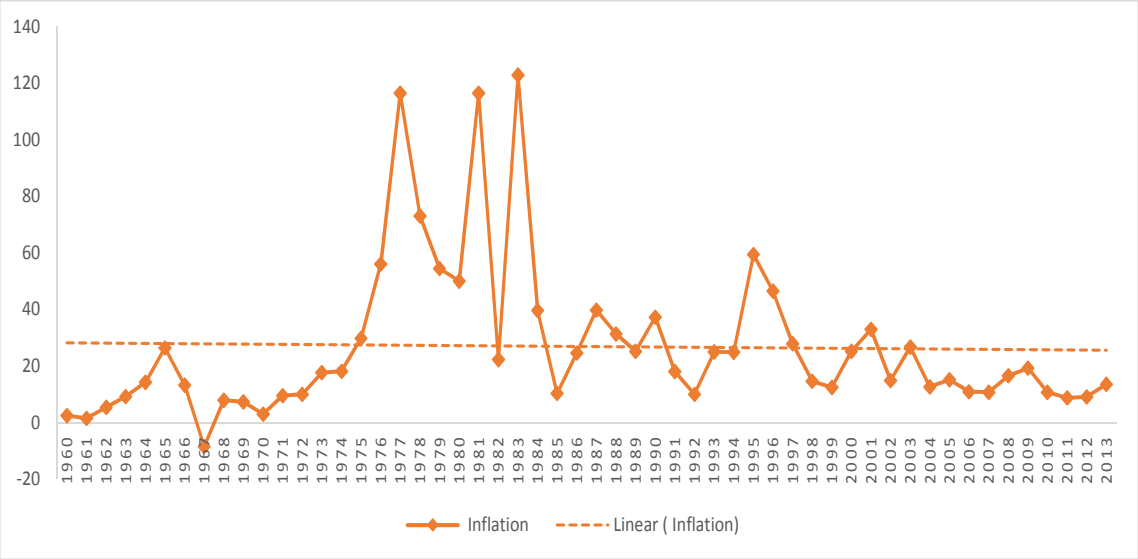
Variables	Interactive terms (ROE*ROA)	
	Coef.	P-value
Liquidity	-0.262**	0.058
Asset Quality	-0.672	0.305
GDP	-0.002***	0.001
Inflation	-0.018****	0.008
Inflation Squared	-0.540****	0.007
Operation Efficiency	0.016	0.832
Bank Size	0.248****	0.000
Money Supply (M2)	-0.228**	0.021
Inflation Turning Point	**15.00**	
Constant	0.859***	0.000
Diagnostics		
Sargan test	0.7495	

4.5 Pattern and Trend of inflation over the period 1960-2013

Figure 1 presents the pattern and trend of inflation. It shows that until 1964, inflation was not really a problem in the Ghana. Ghana experienced her first serious session of inflation in the mid-1960s. The period from independence to 1963 was a normal one in the sense that the previous practice of conservative monetary and fiscal management was more or less maintained. Consequently, the rate of inflation in 1961 was 3.6%. This further fell to 1.7% in 1962 but thereafter rose to 6.8% in 1963. After independence, then government in power (CPP

government) embarked on an industrialization drive with the setting up of many import substitution industries to set up the level of economic development in the country. These import substitution industries relied heavily on imported raw materials and other inputs. However, due to poor management and lack of foreign currencies for the acquisition of such inputs, these industries performed abysmally. Output was therefore minimal and with increased demand, this exerted an upward pressure on price. Inflationary pressure started mounting up between 1964 and 1966. The rate of inflation rose from 9.6% in 1964 to 26.4% in 1965, the highest during the CPP government era. However, it fell in 1966 to 13.3% but this is still unacceptably high compared to rates in the preceding years. One major factor behind the development of the inflationary pressures during the period under review was the government's policy of budgetary deficits, and the financing of deficits mainly by borrowing from the central bank and the commercial banks with the result that more money was pumped into the economy than was warranted by real growth in GDP. In addition, between 1964 and 1965, there was a sharp increase in total payments made to cocoa farmers following the boom in cocoa yield in the 1964/65 cocoa season. This further increased the money supply in the economy by 37.2% and with a decline in the supply of goods due to shortages and import restrictions, there exerted an upward pressure in general price levels resulting in a 16.8% rise in inflation between 1964 and 1965. In addition, there was a 30% devaluation of the domestic currency in 1967 which in effect served as a tax on imports and a subsidy on exports. In other words, devaluation tends to make imports more expensive and exports cheaper thereby stimulating domestic production. Consequently, inflation had declined from 13.3% in 1966 to 9.0% in 1967 and further declined to 7.1% in 1969. In 1970, inflation fell to as low as 3.90. This was due to marked domestic output growth and improved import supplies due to the cocoa boom in 1970. The low inflation rate in 1970 could not be sustained and thus rose to 9.3% in 1971. From 1972 onward, inflation gathered momentum and it has been described in political parlance as a period of "acceleration towards abyss". The rate of inflation increased persistently between 1972 and 1977. In fact, the situation worsened in 1976 and in subsequent years, Ghana's inflation could truly be termed as galloping since it was assuming triple digits. This period witnessed persistent budget deficits in 1972 and 1976; the Deficit-GDP ratio was 6% and 11% respectively. Between 1972 and 1981, inflation averaged about 50% while the average for 1977 and 1981 stood at 116.7%. Inflation hit its all-time figure of 122.8% in 1983, the highest since independence. This is attributed to the intensive drought and bush fires which destroyed large quantities of food crops in 1983 thereby creating acute food shortage in the country. Within the Economic Recovery Program (E.R.P), inflation dropped drastically from all time high of 122.8% in 1983 to 40.2% in 1984 and further fell to 10% in 1985. Between 1986 and the end of 2000, inflation remained above the targets set by the government in the E.R.P. For instance, in 1989, inflation when had fallen from 31.4% to 25% was above the target of 15%. In 1990, inflation rose again to 37% and fell in the subsequent year to 18%. It further fell in 1992 to 10.02% which again was above the target of 8%. The further decline in the rate of inflation in 1992 was due to the conscious effort at monetary control by the government and the good harvest in 1991. The years1993 and 1994 have different stories to tell. The rate of inflation rose from 10.02% 27.7% in 1993 and declined to 24.9% in 1994 but rose to 74.4% in 1995, the highest since the inception of E.R.P. Inflation however declined continuously between 1996 and 1999 falling from 46.6% in 1996 to 12.6% at end of 1999. Unfortunately, this declined could not be sustained as at the year 2000 ended with a disappointing result on inflation. The year-on-year inflation had increased to 40.5%. As at the end of the first quarter of the year 2001 inflation had increased to 41.9% from 40.5% as at the end of December 2000 to 21.3% as at the end of December 2001 representing a 19.2% decline. Inflation reduced to 10.5% as at end of December 2006. Inflation increased to 12.8% in 2007 and 18.1% in 2008. It showed a decline in 2009 to 16.0%. Inflation decreased again to 9.4% in 2010. During the year ended 2011, the inflation declined to 7.7% and 7.1% in 2012. It showed an increase in 2013 to 11.7%.

Figure 1: Trend and Pattern of Ghanaian Inflation from 1960 to 2013



5. Conclusions and Recommendations

The pooled, random effects and generalized method of moment (GMM) models were employed by the study to estimate the effect of inflation on performance of the financial sector. The quadratic function was employed to estimate the turning point of inflation on financial performance. Finally, the linear function was employed by the study to determine the trend and pattern of the inflation across the review. The study concludes that inflation has a negative statistically significant effect on bank performance. The quadratic estimation revealed that the inflation in the Ghanaian economy will continue to have a positive effect on financial sector development unless it reaches a threshold of 15 percent. Finally, the trend analysis showed that inflation has been fluctuating across the years reviewed by the study.

The study recommends a threshold level not above 15 percent of inflation to accelerate the development of the financial sector. This based on the empirical result which indicates that the inflation threshold is 15 percent.

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