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INFLATIONARY THRESHOLDS, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: NEW EVIDENCE FROM TWO WEST AFRICAN COUNTRIES¹

Bernard Njindan Iyke² and Nicholas M. Odhiambo

Abstract

This paper examines the role of inflationary threshold effects in the finance-growth relationship for Ghana and Nigeria. Ghana and Nigeria are relatively homogenous in terms of financial development, economic growth, and inflationary history and therefore provide an acceptable choice for this empirical analysis. Due to lack of data availability, the sample spans the period 1964–2011 for Ghana and 1961–2011 for Nigeria. Using appropriately specified threshold regressions, we found inflationary thresholds in both countries during the study periods. Specifically, the inflationary threshold range for Ghana is 10.73%–29.83%. For Nigeria, the inflationary threshold range is 10.07%–19.25%. By estimating the threshold regressions, we found financial development to have positive and significant effect on economic growth during low and moderate inflationary regimes; and insignificant effect on growth during high inflationary regimes, for both countries. In particular, financial development impact greatly on growth in Ghana when the rate of inflation is below a threshold of 10.73% but dissipates when inflation rate reaches and exceeds 29.83%. Similarly, financial development impact greatly on growth in Nigeria when the rate of inflation is below a threshold of 10.07% but dissipates when inflation rate reaches and exceeds 19.25%. The results imply that policymakers in these countries should take inflation into account when devising policies to promote financial development with the aim of generating economic growth. For without low or moderate inflation rates, such policies will not achieve their intended purposes.

Keywords: *Inflationary Thresholds; Financial Development; Economic Growth; Ghana; Nigeria*

JEL Classification Code: *C22; E44*

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1. Introduction

The role of financial development in economic growth has long been a topic of significant theoretical and empirical interest, dating back to Adam Smith and his allusion to the sprouting of banks and the rapid development of the city of Glasgow. There is growing evidence that the role of financial development in economic growth depends on the level of inflation. The conclusion being that financial development stimulates economic growth under low inflationary environments than under high inflationary environments. The question is: At exactly what level of inflation does financial development enhances economic growth and at exactly what level does the impact dissipate? The answer to this question has very useful policy implications. First, if policymakers know exactly the threshold value of inflation below which financial development improves economic growth, then monetary policies will strictly be devised towards achieving that level of inflation. And most importantly, if differential levels of inflation are a crucial factor when using financial development as a tool to promote growth, then policymakers will learn to put in place inflation moderating policies when reforming the financial sector.

This paper attempts to address the question above by using threshold models. We narrow our scope to consider only Ghana and Nigeria in this paper. These two countries are among the developing countries which are actively implementing financial liberalization policies and at the same time have experienced similar episodes of low and high inflation. In addition, these countries are broadly similar in terms of their level of financial and economic growth. Their macroeconomic policies are broadly similar, and together with the Ivory Coast, are the most important economies in West Africa. To our knowledge, this paper is the first to examine the

three variables namely inflation, financial development, and economic growth from this angle for this two countries.

Generally, the literature has maintained that low and stable inflation is necessary to promote financial development and economic growth. The literature is expansive such that a detailed coverage will be inconceivable. Rising levels of inflation is known to negatively influence economic activity by reducing investment and productivity growth (see Barro, 1991; Fischer, 1993; Bullard and Keating, 1995). It also exerts negative impact on financial development (see Bruno and Easterly, 1998; Boyd et al., 2001). Financial development, in contrast, promotes economic growth by promoting savings and efficient investment of the savings. Well-developed financial systems offer services such as effective monitoring, proper dissemination of financial information, and better pooling of resources, which are necessary for economies to take-off (see Diamond and Dybvig, 1983; King and Levine, 1993; and Levine, 1997). However, a well-functioning financial system will require a low or moderate inflationary environment; meaning that higher rates of inflation impede economic growth by dampening financial development (see Azariadis and Smith, 1996; Hyubens and Smith, 1999; Kim and Lin, 2010).

Clearly, then, the level of inflation matters in the finance-growth relationship. The estimation of such threshold levels of inflation has been a subject of growing research. Various studies have investigated the level at which inflation favours financial development and economic growth, and the level that inflation becomes a debilitating factor. Fischer (1993) found that inflation and economic growth related nonlinearly, and that inflation affected growth positively at lower rates, but negatively at higher rates. This evidence has been supported by studies such as Sarel (1996), Bruno and Easterly (1998), López-Villavicencio and Mignon (2011), Kremer et al. (2013), and

Yilmazkuday (2013). The studies that really explored the role of inflationary threshold effects on financial development and economic growth – and which are closely related to ours – are those of Hyubens and Smith (1999), Gylfason and Herbertsson (2001), Bose (2002), Rousseau and Wachtel (2002), Lee and Wong (2005), Huang et al. (2010), and Eggoh (2012). These studies demonstrated that under low and moderate rates of inflation, financial development tends to stimulate economic, and that financial development works inversely on economic growth under high inflation (see Rousseau and Yilmazkuday, 2009). They argued, in support of their evidence, that higher inflation rates slow down financial development by diminishing the role of money and money denominated assets in the economy. Also, higher inflation rates induce costly flow of information about investment projects; returns to investment become highly volatile, thereby affecting growth negatively (see, also, Lee and Wong, 2005).

Whereas it will be valid to contend that the role of inflationary threshold effects on finance and economic growth has been extensively studied for other countries in the world, the same cannot be said for the two countries in question, namely Ghana and Nigeria. The closest studies to explore this issue are Fabayo and Ajilore (2006), Marbuah (2011), Bawa and Abdullahi (2012), and Doguwa (2012). These studies focused on the threshold relationship between inflation and economic growth. Marbuah (2011) estimated an inflationary threshold of 10% for Ghana, whereas Fabayo and Ajilore (2006), Bawa and Abdullahi (2012), and Doguwa (2012) estimated inflationary thresholds of 6%, 13%, and 10.5%, respectively, for Nigeria. Our aim is therefore to revisit this issue by testing whether there are inflationary threshold effects on financial development and economic growth. We also attempt to estimate such thresholds if they exist as well as estimate their impacts on the finance-growth relationship.

The rest of the paper is organized as follows. In the next section, we present the methodology. Then in section 3, we discuss the data and the empirical results. Section 4 concludes.

2. Methodology

To examine the empirical links between inflation, financial development, and economic growth, we closely follow the literature. Studies such as King and Levine (1993), Odedokun (1996), Beck et al. (2000b), Boyd et al. (2001), Rousseau and Wachtel (2002), Christopoulos and Tsionas (2004) provide concise empirical models from which we derive ours. Our empirical model is specified as follows:

$$Growth_t = \varphi_0 + \varphi_1 \ln GDP_{t-1} + \varphi_2 \ln L_t + \varphi_3 \ln K_t + \varphi_4 \ln BANK_t + \varphi_5 \ln TOT_t + \varphi_6 \ln OPEN_t + \varphi_7 \ln INF_t + \varepsilon_t, \quad (1)$$

where $Growth_t$, GDP_{t-1} , L_t , K_t , $BANK_t$, TOT_t , $OPEN_t$, and INF_t are GDP per capita growth, lag of GDP per capita, labour, capital, financial development, terms of trade, trade openness, and inflation, respectively. \ln is the natural logarithm operator, ε_t is the *iid* error term, t is the time subscript, and φ_i for $i = 1, \dots, 7$ are the parameters of the model.

Several studies including De Gregorio (1992), Jones and Manuelli (1993), Sarel (1996), Huybens and Smith (1999), Boyd *et al.* (2001), Khan and Sehadji (2001), Bose (2002), Lee and Wong (2005) have shown that high rate of inflation exerts negative impact on economic growth and financial development. Some of these studies emphasized possible inflationary threshold effects in these relationships. Following these studies, we fit a threshold version of *Eq. (1)* that may capture any inflationary threshold effects in finance-growth nexus. Threshold regressions date to

the seminal paper of Tong (1978). By assuming that we have two inflationary regimes³, our empirical threshold regression takes the following form:

$$\begin{aligned}
Growth_t = & (\varphi_{10} + \varphi_{11} \ln GDP_{t-1} + \varphi_{12} \ln L_t + \varphi_{13} \ln K_t + \varphi_{14} \ln BANK_t + \varphi_{15} \ln TOT_t \\
& + \varphi_{16} \ln OPEN_t + \varphi_{17} \ln INF_t) I[q_t \leq \gamma] \\
& + (\varphi_{20} + \varphi_{21} \ln GDP_{t-1} + \varphi_{22} \ln L_t + \varphi_{23} \ln K_t + \varphi_{24} \ln BANK_t + \varphi_{25} \ln TOT_t \\
& + \varphi_{26} \ln OPEN_t + \varphi_{27} \ln INF_t) I[q_t > \gamma] + \epsilon_t,
\end{aligned} \tag{2}$$

where $I[\cdot]$ is an indicator function, q_t is the threshold variable, γ is the threshold value. The indicator function turns to one if $q_t \leq \gamma$ and zero if $q_t > \gamma$. $\epsilon_t \sim iid(0, \sigma^2)$. φ_{1i} and φ_{2i} for $i = 1, \dots, 7$ are parameters of the model.

Eq. (2) is similar to Eq. (1) except that its parameters assume different values in different regimes. Hence, the solution to Eq. (2) requires that we determine the threshold value which minimizes the sum of squared errors:

$$S(\gamma) = \hat{\epsilon}_t(\gamma)' \hat{\epsilon}_t(\gamma). \tag{3}$$

Here, q_t is inflation and γ its threshold value. The analysis of Eq. (2) entails that we test for threshold effects. In other words, we test the null hypothesis of no threshold effect against the alternative that there are two thresholds. The standard approach for testing such hypotheses becomes infeasible in this context because the threshold parameter γ is not identified under the null hypothesis. Hansen (2000a) proposed a Lagrange Multiplier (LM) approach for surmounting this problem. His approach entails that we compute the p-values accompanying γ by a fixed bootstrap method (see Hansen, 2000a). Take the hypotheses of interest given as follows:

³ This assumption is in order to keep the model simple. The empirical analysis which follow assume more than two regimes in order to match the observe behaviour of macroeconomic variables or policies.

$$H_0: \varphi_{1i} = \varphi_{2i} \text{ for } i = 1, \dots, 7 \quad (4a)$$

$$H_0: \gamma = \gamma_0 \quad (4b)$$

Eq. (4a) states that parameters are the same over time or there is no threshold effect. *Eq. (4b)* states the threshold value is known and can be estimated as γ_0 . These hypotheses can be tested using Hansen's (2000a) approach.⁴

In this paper, we move in a different direction. *Eq. (2)* and the subsequent hypotheses are well discussed in breakpoint testing and regression literature (see, for example, Hansen, 2000b; Bai and Perron, 2003; Perron, 2006). If we permute the observation index so that the threshold variable is non-decreasing, then the estimation of the threshold and breakpoint models is fundamentally equivalent (see Bai and Perron, 2003). That is, threshold models are just breakpoint least squares models whereby the data is reordered with respect to the threshold variable. In the same chain of thought, breakpoint models are threshold models with time as the threshold variable (see Perron, 2006). Hence, we test *Eqs. (4a)* and *(4b)* following the breakpoint regression literature.⁵

3. Data and Empirical Results

3.1. Data

The data used for the empirical analysis are annual. For Ghana, the period covered is 1964–2011 and for Nigeria, 1961–2011. The consideration of the study period is motivated by the

⁴ See Hansen (2000a) for the theoretical derivations and Monte Carlo exercises of this approach. See also Lee and Wong (2005) for an application of this approach.

⁵ This literature is well known. We preserve space by not focusing on it. The interested reader may consult Bai and Perron (2003) and Perron (2006), for extensive discussion.

availability of data. The dependent variable, Growth is the annual growth rate of real GDP per capita taken from the World Development Indicators (WDI, 2015). This measure has also been used by King and Levine (1993a), and Beck *et al.* (2000b). We measured the variable of interest, financial development, as BANK. This is the ratio of bank credit to bank credit plus central bank domestic assets. BANK is taken from the Financial Development and Structure Database compiled by Beck *et al.* (2000a, 2009), and Čihák *et al.* (2012). The choice of BANK as against other measures is that for developing countries, commercial banks are becoming very important financial institutions for economic activities when compared with central banks, and therefore serves as indicator of whom is allocating funds in the economy (see Levine, 1997). The control variables, namely, labour (L), capital (K), terms of trade (TOT), and trade openness (OPEN) are taken from Penn World Tables version 8.0 compiled by Feenstra *et al.* (2013). The other control variables, initial income (GDP(-1)) and inflation (INF), are taken from the WDI (2015). The choice of these variables is broadly consistent with the existing literature (see, for example, King and Levine, 1993; Lee and Wong, 2005). Except for Growth, all the variables are in natural logarithms to moderate outliers.⁶

Table 1 shows the summary statistics of the raw data. Mean inflation has been higher in Ghana as compared with Nigeria (i.e. 29.5% and 16.8%, respectively). The maximum inflation rates recorded in Ghana and Nigeria are respectively, 122.9% and 72.8%. The minimum inflation rates are -8.4% and -3.7% for Ghana and Nigeria, respectively. Generally, it appears that the Ghanaian economy operated under a higher inflationary environment when compared with the Nigerian economy. The inflationary conditions in both countries may have reflected in their mean growth rates. On the average, economic growth in Nigeria has been 0.7% higher than that of Ghana (see

⁶ The datasets are available upon request.

Table 1). Similarly, the size of financial development in Nigeria has been 26.2 higher than that of Ghana. We must however be cautious about this comparison. Nigeria is several times larger than Ghana in terms of landmass and population, and should therefore possess a larger banking sector and a higher per capita growth, other things being equal.

Table 1: Summary Statistics of the Raw Data

Ghana							
Variables	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis
<i>BANK</i>	41.735	34.788	80.900	15.925	18.997	0.652	2.171
<i>GDP</i>	450.396	439.603	730.224	320.772	84.820	1.202	4.844
<i>Growth</i>	0.944	1.883	12.422	-14.455	4.667	-0.962	4.955
<i>INF</i>	29.476	20.773	122.875	-8.422	28.271	2.004	6.834
<i>K</i>	85836.560	81399.120	140554.700	74810.360	13955.940	2.379	8.258
<i>L</i>	6.006	5.254	11.095	2.948	2.560	0.505	1.873
<i>OPEN</i>	52.256	43.246	116.048	6.320	28.188	0.531	2.384
<i>TOT</i>	104.840	108.664	133.975	65.678	17.181	-0.696	2.749
Nigeria							
<i>BANK</i>	67.898	69.130	98.016	30.677	18.154	-0.315	2.142
<i>GDP</i>	684.651	612.130	1052.175	468.102	157.248	0.635	2.192
<i>Growth</i>	1.620	1.952	30.344	-17.562	8.448	0.719	5.446
<i>K</i>	292227.700	347567.000	432161.800	77473.800	112050.200	-0.834	2.072
<i>INF</i>	16.778	11.710	72.836	-3.726	16.466	1.743	5.510
<i>L</i>	29.833	28.141	50.629	15.832	10.141	0.394	1.981
<i>OPEN</i>	44.953	43.315	81.813	19.621	17.371	0.213	1.891
<i>TOT</i>	108.538	98.841	189.470	69.551	25.841	0.870	3.191

Note: Min., Max., and Std. Dev. denote, respectively, minimum, maximum, and standard deviation.

Figure 1 and 2 show the movements of inflation, financial development and economic growth indicators in the two countries. It can be seen that during the late 1960s and the early 1970s, inflation was low in Ghana. This period was characterized by high financial development, and high economic growth. From the mid-1970s to the early 1980s, inflation became high and volatile, financial development and economic growth declined as a result. From the late 1980s to

2011, inflation rate has been moderate. Although financial development has declined during some point, it has generally increased. This period has witnessed sustained economic growth (see Figure 1). For Nigeria, the period between 1961 and the early 1970s has witnessed low and sometimes stable inflation. During that period, financial development has accelerated and so has economic growth. During the 1990s, inflation was high and unstable, leading to declining financial development, and low but stable economic growth. However, during the 2000s, inflation has declined; thereby promoting financial development and fast economic growth (see Figure 2). This evidence indicates the possibilities of inflationary thresholds in the finance-growth linkage. In what follows, we attempt to formally assess these possibilities.

Figure 1: Inflation, Financial Development and Growth in Ghana

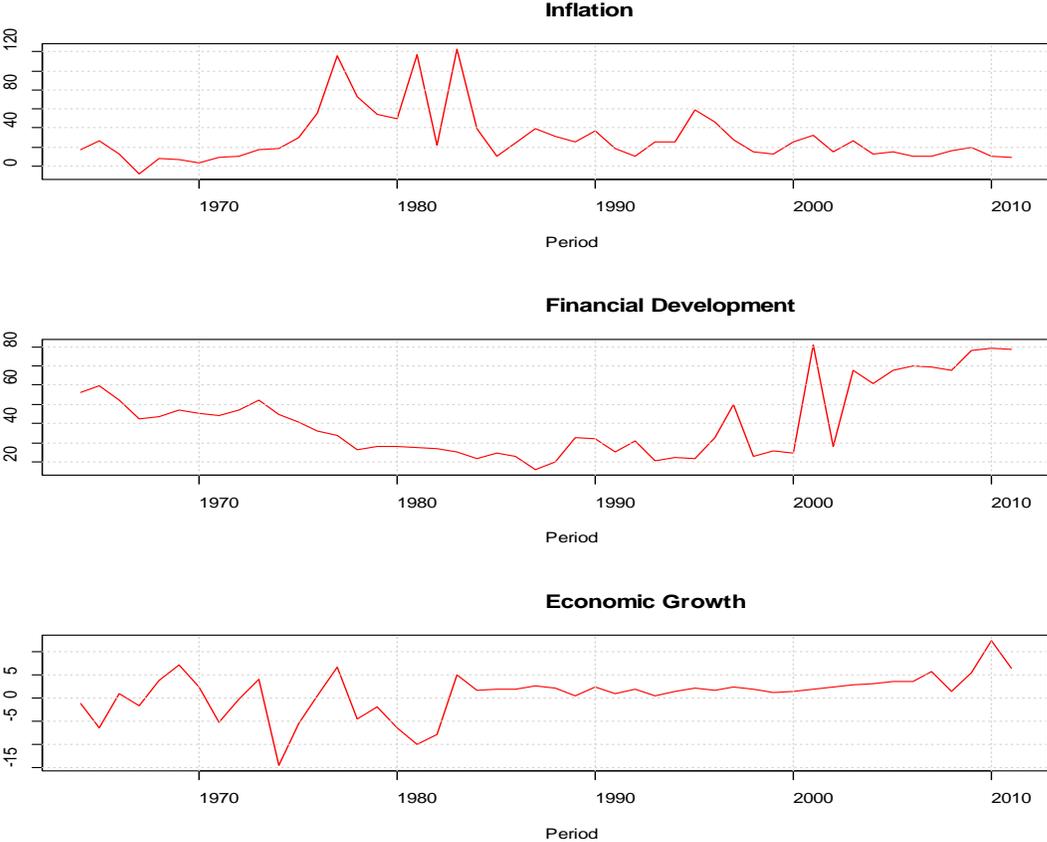
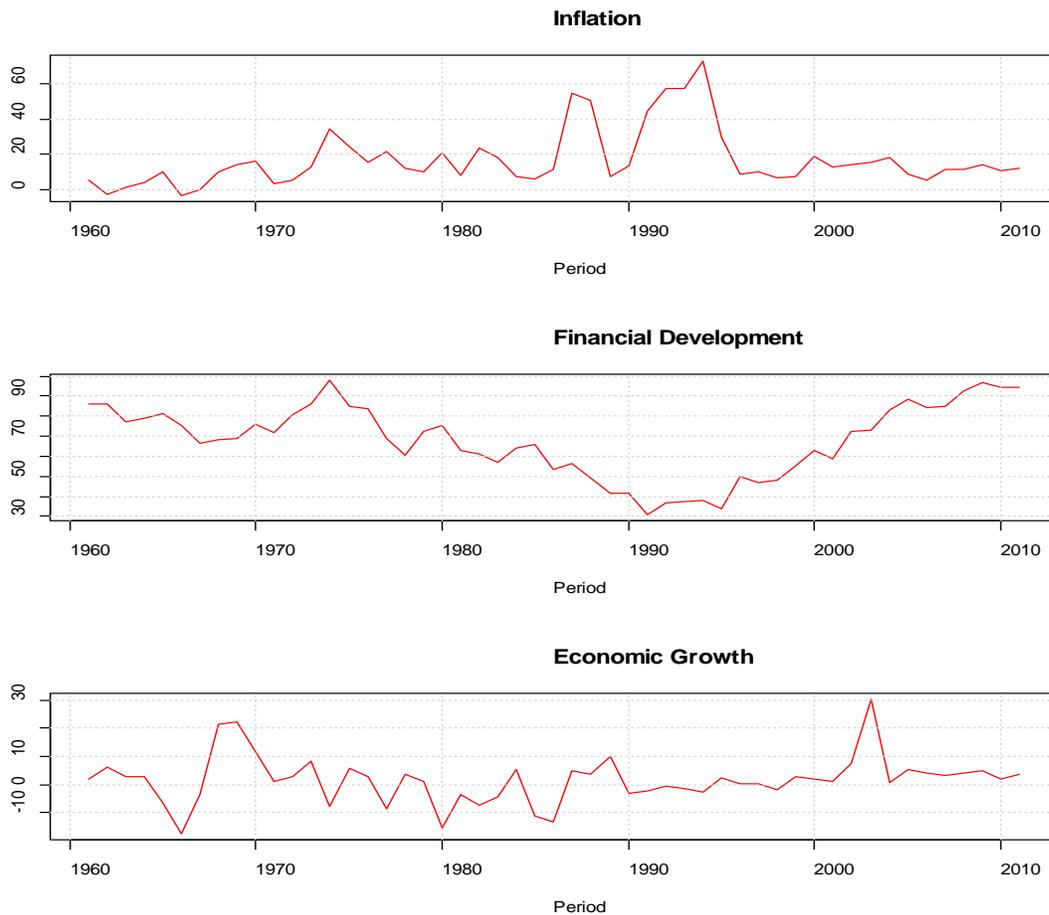


Figure 2: Inflation, Financial Development and Growth in Nigeria



3.2. Unit Roots Analysis

A vital component of time series analysis is unit root testing. Tables 2 and 3 show the results of unit root test for the variables using DF-GLS and the Ng-Perron tests as proposed by Elliot *et al.* (1996), and Ng and Perron (2001), respectively. Lag selection is very important in unit root testing since the t-statistics are sensitive to the number of lags chosen for the auxiliary regression. Here, we selected the lags such that there is no serial correlation in the residuals. For Ghana, we found no evidence of unit roots in growth, initial income, and terms of trade. Also, we

found no evidence of unit roots after differencing labour, capital, inflation, trade openness, and financial development once (see Table 2). For Nigeria, we found no evidence of unit roots in growth, initial income, capital, and inflation. In addition, we found no evidence of unit roots in labour, terms of trade, trade openness, and financial development after first difference (see Table 3).

Table 2: Tests for Unit Roots in Ghana

Variable	DF-GLS (Drift)	DF-GLS (Trend)	Ng-Perron (Drift)	Ng-Perron (Trend)
<i>lnGrowth</i>	-2.453(2)**	-5.352(0)***	-13.321(2)***	-22.2145(0)***
<i>lnGDP(-1)</i>	-3.437(0)***	-4.782(0)***	-15.985(1)***	-20.373(0)***
<i>lnL</i>	-0.012(1)	-1.849(1)	-3.886(1)	-6.583(1)
Δ <i>lnL</i>	-1.971(2)**	-3.107(1)*	-10.430 (0)**	-15.381(0)*
<i>lnK</i>	1.356(2)	-0.185(2)	-0.431(3)	-3.542(3)
Δ <i>lnK</i>	-4.740(0)***	-3.233(1)**	-15.148(2)***	-25.465(1)***
<i>lnINF</i>	-1.492(5)	-1.782(5)	-6.941(5)*	-9.205(5)
Δ <i>lnINF</i>	-9.016(0)***	-9.665(0)***	-18.689(0)***	-17.749(0)**
<i>lnTOT</i>	-1.687(1)*	-4.984(1)***	-7.690(0)*	-21.375(0)**
<i>lnOPEN</i>	-1.079(2)	-1.559(2)	-3.167(2)	-5.579(2)
Δ <i>lnOPEN</i>	-4.702(0)***	-4.765(0)***	-20.445(0)***	-20.555(0)***
<i>lnBANK</i>	-1.195(1)	-0.689(1)	-3.106(1)	-1.462(3)
Δ <i>lnBANK</i>	-6.146 (0)***	-12.107 (0)***	-23.251(1)***	-16.519(0)*

Notes: *, ** and *** denote significance at 10%, 5% and 1%, respectively. Δ denotes first difference operator.

Table 3: Tests for Unit Roots in Nigeria

Variable	DF-GLS (Drift)	DF-GLS (Trend)	Ng-Perron (Drift)	Ng-Perron (Trend)
<i>lnGrowth</i>	-5.093(0)***	-5.131(0)***	-22.641(0)***	-22.728(0)***
<i>lnGDP(-1)</i>	-4.766(0)***	-4.954(0)***	-21.024(0)***	-21.512(0)**
<i>lnL</i>	0.451(3)	-2.787(1)	2.034(0)	-4.920(1)
Δ <i>lnL</i>	-4.165(0)***	-4.256(0)***	-19.279(0)***	-19.551(0)**
<i>lnK</i>	-4.574(3)***	-4.611(2)***	-15.129(3)***	-33.514(3)***
<i>lnINF</i>	-2.368(5)***	-3.860(0)***	-14.764(0)***	-16.682(0)*
<i>lnTOT</i>	-0.9997(1)	-2.725(1)	-3.671(0)	-14.325(0)*
Δ <i>lnTOT</i>	-8.519(0)***	-8.543(0)***	-23.476(0)***	-23.447(0)***
<i>lnOPEN</i>	-0.608(7)	-2.420(1)	-1.354(7)	-14.784(0)*
Δ <i>lnOPEN</i>	-3.809(1)***	-3.946(1)***	-12.169(1)**	-23.155(1)***
<i>lnBANK</i>	-1.246(0)	-1.179(0)	-3.037(0)	-3.204(0)
Δ <i>lnBANK</i>	-4.889(1)***	-5.122(1)***	-21.305(1)***	-22.864(1)**

Notes: *, ** and *** denote significance at 10%, 5% and 1%, respectively. Δ denotes first difference operator.

3.3. Tests for Inflationary Threshold Effects

Are there inflationary threshold effects in the relationship between financial development and economic growth? To answer this question, we need a formal test of threshold effects. The threshold regression model presented in Eq. (2) with the accompanying hypotheses permit us to formally assess this question. The objective, then, is test the null hypothesis of a linear model against the alternative of at least thresholds (or two-regimes). Since the threshold parameter is not identified under the null hypothesis, we cannot apply conventional tests since their distributions will be non-standard. In light of this, Hansen (1996) proposed a bootstrap technique for simulating the asymptotic distribution of the likelihood ratio test of the null hypothesis. However, in this paper, we report the results of the threshold tests and the asymptotic critical

values based on Bai and Perron (2003).⁷ The main results of the threshold tests are reported in Table 4.

In the case of Ghana, we found the model to contain a maximum of two thresholds. These inflationary thresholds are 10.733%, and 29.825%. We can therefore characterize the first threshold as being the period of low inflation and the second as the period of high inflation. The period in-between the two thresholds will denote moderate inflation regime. In the case of Nigeria, we found the model to contain a maximum of three thresholds. These are 10.067%, 13.238%, and 19.251%. The characterization in this case will be very similar to the one for Ghana. We discuss this in detail in section 3.4. Other studies such as Sarel (1996) and Khan and Senhadji (2001), Lee and Wong (2005), Huang *et al.* (2010), and Eggoh (2012) found evidence of inflationary threshold effects as well. The difference between our paper and theirs is that they are either based on panels of countries, cross-sectional data or economies that are entirely different from the ones we considered here.

Table 4: Tests for Inflationary Threshold Effects

Ghana				
Threshold Test	F-statistic	Scaled F-statistic	Critical Value ⁺	Threshold values
0 vs. 1	6.481**	25.924**	16.190	10.733
1 vs. 2	5.918**	23.671**	18.110	29.825
2 vs. 3	4.325	17.300	18.930	
Nigeria				
Threshold Test	F-statistic	Scaled F-statistic	Critical Value ⁺	Threshold values
0 vs. 1	24.828**	99.313**	16.190	10.067
1 vs. 2	16.510**	66.041**	18.110	13.238
2 vs. 3	6.327**	25.308**	18.930	19.251
3 vs. 4	1.359	5.4361	19.640	

Note: ** denotes significance at the 5% level. + are Bai and Perron (2003) critical values.

⁷ All computations and plots in this paper are carried out in R software. The script is available upon request.

3.4. Inflationary Threshold Effects on Financial Development and Growth

The final empirical analysis involves the estimation of the model of financial development and economic growth when inflationary threshold effects are present. To ensure suitable comparison, we estimate a linear model (i.e. the model without thresholds) and the threshold models. The results of this estimation are presented in Tables 5 and 6, corresponding to Ghana and Nigeria, respectively.

Looking at Table 5, the linear model shows that financial development promotes economic growth in Ghana. That is, 1% change in the growth of financial development (i.e. $\Delta \ln BANK$) leads to approximately 0.172% increase in growth.⁸ We can see that during the low inflation regime, financial development has higher impact on economic growth (i.e. 0.295) than when the economy moves into a moderate or high inflation regimes (i.e. 0.148 or 0.054). In fact, as inflation reaches and exceeds a threshold of 29.825%, financial development becomes insignificant in economic growth for Ghana. This is consistent with similar studies on other countries such as Huybens and Smith (1999), Bose (2002), and Lee and Wong (2005). In addition to these results, we found terms of trade, and trade openness to exert positive effects on economic growth. The theory is decisive on the impact of terms of trade on economic growth but it is still ambiguous on the role of openness on growth. These results are therefore consistent with the literature. Finally, whereas initial income and labour have the right signs, capital stock has the wrong sign. Overall, our results are broadly consistent with the theory.

⁸ Note that the dependent variable, Growth, is not in natural logarithm. Hence, the coefficients in these models should be viewed as the partial elasticities.

Table 5: Inflationary Threshold Effects and the Finance-Growth Nexus in Ghana

Explanatory Variables	Linear Model	Low Inflation	Moderate Inflation	High Inflation
Threshold value		≤ 10.733	$10.733 \sim$	≥ 29.825
<i>Constant</i>	0.236*** (9.562)	0.307*** (10.824)	0.054** (2.602)	0.069** (2.825)
<i>lnGDP(-1)</i>	-0.207*** (-19.602)	-0.175*** (-27.061)	-0.198*** (-16.513)	-0.250*** (-14.295)
$\Delta \ln L$	0.259** (2.685)	0.466** (3.169)	0.256** (2.169)	0.213** (2.369)
$\Delta \ln K$	-0.173** (-2.609)	-0.772** (-2.303)	-0.642** (-2.342)	-0.679** (-2.471)
<i>lnTOT</i>	0.023 (1.601)	0.033** (2.235)	0.437** (2.405)	0.010 (1.283)
$\Delta \ln OPEN$	0.010** (2.842)	-0.024 (-0.720)	0.014** (2.533)	0.211** (2.950)
$\Delta \ln BANK$	0.172** (2.538)	0.295** (2.864)	0.148** (2.461)	0.054 (1.512)
<i>lnINF</i>	-0.049* (-1.903)	-0.193*** (-3.457)	-0.148** (-2.370)	-0.296*** (-4.428)
Adjusted R ²	0.974	0.803	0.825	0.817
Observations	47	10*	22*	15*

Notes: *, ** and *** denote significance at 10%, 5% and 1%, respectively. Δ denotes first difference operator. The t-statistics are in the parentheses. * is based on sample splitting.

Table 6 shows the results for Nigeria. Here, we obtained three thresholds for inflation. Hence we demarcated the inflationary regimes as follows: inflation rate of 10.067% or less represents low inflation regime; above 10.067% and below 19.251% represents moderate inflation regime; while a rate of 19.251% and above represents high inflation regime. Again, we report the linear estimation and the threshold estimation for comparison purposes. Table 6 shows that financial development has positive and significant effect on economic growth in Nigeria under a linear model. That is 1% change in financial development leads to 0.328% increase in economic growth. As in the case of Ghana, financial development generates higher economic growth during periods of low inflation than during periods of moderate or high inflation. The point

estimates are 0.231%, 0.164–0.110%, and 0.048% for low, moderate and high inflation, respectively. Indeed, the impact of financial development on economic growth becomes insignificant under high inflationary regime (see Table 6). The evidence casts support for the ones established in studies such as De Gregorio (1992), Sarel (1996), Gylfason and Herbertsson (2001), Bose (2002), Rousseau and Wachtel (2002), and Lee and Wong (2005) that higher rates of inflation generally slow down financial development and economic growth. In addition to these results, the remaining variables have theoretically consistent signs.

Table 6: Inflationary Threshold Effects and the Finance-Growth Nexus in Nigeria

Explanatory Variable	Linear Model	Low Inflation	Moderate Inflation	Moderate Inflation	High Inflation
Threshold value		≤ 10.067	10.067~	13.238~	≥ 19.251
<i>Constant</i>	0.216*** (5.356)	0.152*** (4.104)	0.188** (2.980)	0.026** (2.351)	0.100** (2.752)
<i>lnGDP(-1)</i>	-0.155*** (-15.644)	-0.193*** (-5.813)	-0.133*** (-12.874)	-0.162*** (-5.620)	-0.135*** (-12.341)
$\Delta \ln L$	0.227*** (3.380)	0.176** (2.584)	0.164* (1.977)	0.133** (2.638)	0.003 (1.085)
<i>lnK</i>	0.008* (1.908)	0.055** (2.153)	0.200*** (3.153)	0.158** (2.677)	0.120** (2.100)
$\Delta \ln TOT$	0.010 (0.628)	0.517*** (9.355)	0.008 (0.230)	0.039** (2.779)	0.018 (1.287)
$\Delta \ln OPEN$	0.028 (1.579)	0.315*** (3.780)	0.361** (2.811)	0.023 (0.783)	0.051** (2.517)
$\Delta \ln BANK$	0.328*** (4.186)	0.231*** (3.321)	0.164** (2.839)	0.110** (2.362)	0.048 (1.336)
<i>lnINF</i>	-0.228*** (-3.589)	-0.142** (-2.594)	-0.136** (-2.358)	-0.192** (-2.769)	-0.267*** (-3.750)
Adjusted R ²	0.964	0.886	0.941	0.759	0.879
Observations	48	7*	7*	9*	25*

Note: *, ** and *** denote significance at 10%, 5% and 1%, respectively. Δ denotes first difference operator. t-statistics are in the parentheses. * is based on sample splitting.

4. Conclusion

There is growing realization that financial development influences economic growth differently during different inflationary regimes. This paper joins the growing literature by examining the impact of financial development on economic growth and accounting for inflationary threshold effects for Ghana and Nigeria. These countries are very similar in terms of their economic, cultural, political, and institutions fundamentals as well as their geographic locations. Due to lack of data availability, we used different starting dates for the two countries. Hence for Ghana, the sample spans the period 1964–2011; and for Nigeria, it spans 1961–2011. By using appropriate threshold models and methods to test for the existence of inflationary thresholds, we found inflationary thresholds in both countries during the study periods. Specifically, the inflationary threshold range for Ghana is 10.73%–29.83%. For Nigeria, the inflationary threshold range is 10.07%–19.25%. In addition, we estimated linear and non-linear regression models for each country after establishing these inflationary thresholds. We found that, for both countries, financial development tends to have positive and significant effect on economic growth during low and moderate inflationary regimes; and insignificant effect on growth during high inflationary regimes. In particular, financial development impact greatly on growth in Ghana when the rate of inflation is below a threshold of 10.73% but dissipates when inflation rate reaches and exceeds 29.83%. In a similar vein, financial development impact greatly on growth in Nigeria when the rate of inflation is below a threshold of 10.07% but dissipates when inflation rate reaches and exceeds 19.25%. These results are very consistent with the existing empirical literature. The results therefore imply that policymakers in these countries should take inflation into account when devising policies to promote financial development with the aim of generating

economic growth. For without low or moderate inflation rates, such policies will not achieve their intended purposes.

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