Understanding the impact of Commercial Banks Lending Rate on Economic Growth: An Empirical Evidence from Ghana.

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Abstract

The main objective of this paper is to investigate the impact of lending rate on economic growth in Ghana. To do this, we employ the autoregressive distributed lags model (ARDL) and the Toda and Yamamoto (1995) causal approach as estimation strategy. The estimates from the ARDL model suggest that ceteris paribus one percent increase in lending rate generates approximately 0.15 decrease in economic growth of Ghana in the long. In the short run, one percent increase in lending rate also generates approximately 0.112 percent decrease in economic growth. Contrary to the widespread belief that lending rate induce economic growth, we find that gross domestic product rather spurs lending rate, using Toda and Yamamoto (1995) causal approach. Our findings suggest that monetary authorities should embark on policy interventions that aim at taming lending rate towards growth enhancing targets. This will encourage individuals, firms and other institutions to borrow from commercial banks to increase investment and consumption to accelerate economic growth. Other policy interventions include strengthening inflation targeting policy to reduce and stabilize inflation while taming exchange rate, monetary policy and treasury bill rate towards growth enhancing targets.

**Keywords:** Economic growth; lending rate; co-integration and Ghana.

1. Introduction

In an era of globalization where developing countries are increasingly searching for ways to ensure sustained increases in income, stabled inflation/ lending rates, improvement in employment and sanitation, alleviation of poverty, improvement in health and increase in productivity among others; economic growth has become an imperative factor on the economic policy agenda of many developing countries. Following this, both theoretical and empirical studies have been devoted to ascertain the factors that drive economic growth of emerging economies (Kharusi and Ada, 2018, Mamun et al., 2018, Ufoeze et al., 2018, Pradhan et al., 2015, Saymeh and Orabi, 2013, Todaro and Smith, 2012, Romer, 1994, Rebelo, 1991, Khan et al., 2020). Based on theory, there are three key components of economic growth, which are of prime importance. These include; capital accumulation comprising new investment in land, physical, equipment and human resources through improvement in health, education and job skills, population growth resulting in an increment in labour force participation and technological progress, thus, modern ways of accomplishing difficult task (Todaro and Smith, 2012). From the theoretical perspective, it implies that any policy aimed at attaining a sustained growth in an economy should have either one or more of the aforementioned components in it. However, empirical studies have also shown that other relevant macroeconomic indicators such as monetary policy, inflation, exchange rate, stock market development, external debt, interest rate

and foreign direct investment among others also affect economic growth of an economy (Barguellil et al., 2018, Chu et al., 2017, Saymeh and Orabi, 2013).

What is prominent and also missing in empirical literature, however, is that with the recent insurgence of the banking sector, lending rate has become one of the relevant factor that influence economic growth. Though the banking sector held on to assets (money) for its clients to be retrieved at a later date, it has always played an intermediary role of taking money from lenders and giving it to governments, institutions and individuals as loans. For instance, banks have been a major source of funding for small businesses (Baidoo and Yusif, 2019, Petersen and Rajan, 1994).Whiles these offers are made by the banks; they come with a charge known as lending rate (Kalu, 2009). Therefore, the lending rates influence the ability of local firms and other institutions to borrow and invest to expand and produce. Lending rate also affects consumption since individuals also borrow from banks to purchase goods and services thereby increasing their consumption. As a result, lending rate has a potential influence on economic growth since consumption and investment are affected. Unfortunately, commercial bank's lending rate over the period of 2007 to 2017(see figure 1) have been unstable. For instance, the minimum rate over the ten years period under study was around approximately 19 percent in 2007, while the highest over the period was also around 31 percent recorded in 2009. Since then, the rate has been falling between 2010 to 2013. From 2014 and beyond, the rate was rising steadily and became stable with little fluctuations beyond 2016. These fluctuations in lending rate deter borrowing, as borrowers cannot predict future cost of borrowing. Hence, unstable lending rate can decease investment via decrease in borrowing to decrease economic growth.

Figure 1: Quarterly trends in commercial banks' lending rate over the period of 2007 to 2017
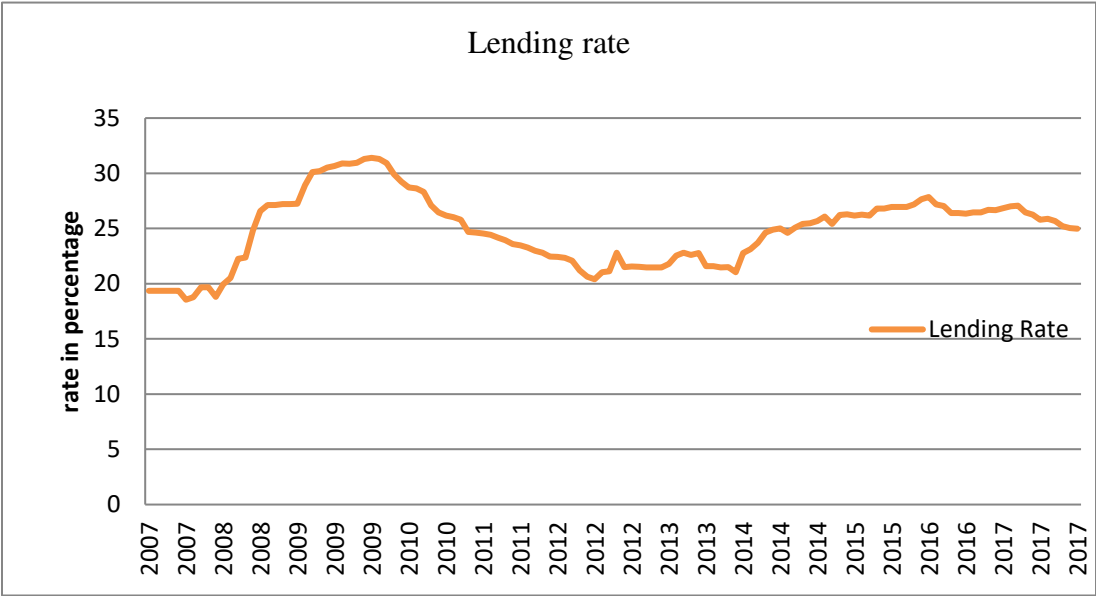
Coincidentally, the economic growth of the Ghanaian economy has been unstable, as it has experienced significant fluctuations in the same period (2007 to 2017) as shown figure 2. This seems to postulate that lending rate drive economic growth along the fluctuation path via

fluctuations in borrowing which influences investment and consumption significantly. Though periodic measures have been put in place to eradicate the fluctuations in the growth rate of the Ghanaian economy, the problem is still prevalent. According to the African Development Bank (2019), the real gross domestic product (GDP) of Ghana increased by 8.5 percent after the sluggish growth experienced in 2015 and 2016. Within this period, the nation was recognized as the fastest growing country in sub-Saharan Africa. Real gross domestic product (GDP) then again fell to 6.2 percent in 2018. It is expected that increasing lending rates of the commercial banks in Ghana should have potential influence on the fluctuations in economic growth. This is so because, according to theory, economic growth is influence by an increase in lending rates (interest rates). Thus, higher lending rates are assumed to increase the cost of borrowing, reduce consumer expenditure and reduce investment. Even though these higher rates puts lesser money into the hands of consumers, inflation rates are expected to minimize whiles the country experiences an appreciation in its local currency.

Figure 2: Quarterly trends in economic growth over the period of 2007 to 2017

Although these assertions need to be tested empirically, recent empirical studies on lending rate and economic growth are scanty in developing countries especially, in Ghana. A closely related empirical work by Ladime et al. (2013) focused on the determinants of banks' lending behavior in Ghana from a period of 2001 to 2006. Our empirical study differs significantly from this study by focusing on the impact lending rate has on economic growth of Ghana. In addition, our study used more recent data and relatively larger sample period from 1990 to 2017 as compared to Ladime et al. (2013) that used from 2001 to 2006. One advantage of using a more current data is that it helps examine the phenomenon in a more contemporary era. Furthermore, our study pays attention to economic growth because attaining a sustained economic growth has always been the main objective of every economy especially the developing ones (HUIDUMAC PETRESCU and Pop, 2015). Further, we differentiate our study from others research work by including different macroeconomic control including inflation, monetary policy rate, exchange rate and foreign direct investment as control variables which are significantly different from the control

variables employed by Ladime et al. (2013). These macroeconomic variables are important indicators of economic growth in every economy hence it is very crucial to include these variables as controls when analyzing economic growth of an economy empirically. Additionally, due to the important contributions of lending rate to economic growth and development, high unstable lending rate does adversely affect the social and economic development of a country. To avoid such situation, empirical studies are carried out among other effort to regulate and stabilize lending rate over a long period. Lastly, Novel feature of our study are the analysis of the causative relationship between lending rate and economic growth. The rest of the study is organized in the following form; literature review, methodology, results and discussion and conclusions and policy recommendations.

2. Literature review

Economists have paid much attention to how macroeconomic variables affect growth of developed and developing countries. However, what has dominated empirical literature is how inflation affects economic growth. It is generally accepted that inflation has a negative repercussion on economic growth across different countries. Notwithstanding this, between 1950 and the 1960, several empirical works provided enough evidence that the impact of inflation on economic growth was not significant (Dorrance, 1963, Bhatia, 1960, Wai, 1959). This insignificant finding proved wrong by different researchers between 1970 to 1990 as they were able to empirically find a negative relationship between inflation and as well as other macroeconomic variables and economic growth (Sbordone and Kuttner, 1994, Smyth, 1994, Fischer, 1993, De Gregorio, 1993). Within these periods, several countries started experiencing a decline in macroeconomic performance as well as experiencing balance of payment crises. To mention a few, unemployment increased, local currency depreciated, import increased and export also decreased. This drew the attention of researchers to further examine the relationship between inflation and economic growth in different countries. Different studies in different countries were able to confirm empirically that inflation has a negative impact on economic performance (Sbordone and Kuttner, 1994, Smyth, 1994, De Gregorio, 1993). By the close of 2000s, it was empirically recognized worldwide that inflation has a negative consequence on economic growth. Today, the worldwide recognition of the impact of inflation on economic growth rate still persists. Several studies have also provided empirical evidence of the negative impact inflation has on economic growth. For instance, Chu et al. (2017), Zulkhibri and Rani (2016) and Pradhan et al. (2015) and Bassey and Onwioduokit (2011) in their empirical studies established that inflation have negative effect on economic growth.

In recent empirical studies, researchers have moved beyond examining the impact of inflation on economic growth. Others have also paid attention to how other relevant macroeconomic variables affect economic growth in both developing and developed countries. For instance, Salami (2018) investigated the effect of interest rate on economic growth of Swaziland. The time series data used in the study covered the period of 1980-2016 and was extracted from World Bank. Using the ordinary least squares estimator, the study showed that deposit interest rate exerted a negative and significant effect on economic growth of Swaziland.

In a related study, Saymeh and Orabi (2013) also employed the pair wise Granger causality as the analytical tool to investigate the effect of interest rate, inflation rate, and GDP on real

economic growth rate in Jordan. Time series data from the period of 2000-2010 was used. After using the Augmented Dickey Fuller test to ascertain the stationarity properties of the variables test, the results from the pair wise granger causality revealed that current interest rate had a negative influencing power on growth rate.

Similarly, in Bangladesh, Mamun et al. (2018) examined the causality between stock market development and economic growth. The study employed the ARDL bounds testing approach as well as the granger causality as an estimation technique and used time series data spanning 1993 to 2016 from the World Bank (2016) and Bruegel Datasets (2016). The results from the granger causality test revealed a bidirectional causal relationship between stock market development and economic growth. In Nigeria, Nwani and Bassey (2016) also employed the autoregressive distributed lag (ARDL) approach to co-integration as an estimation strategy and examined how stock market and banking sector development affected economic growth over the period of 1981-2014. The time series data used in the studies were sourced from the World Bank, Central Bank of Nigeria, BP Statistical Review of World Energy and Statistical Bulletin. The result from their study showed that both stock market and banking sector development were insignificant in influencing economic growth of Nigeria.

Employing the ordinary least squares model as an estimation strategy, Ufoeze et al. (2018) also did investigate the effect of monetary policy on economic growth of Nigeria. The study used time series data covering the period 1986 to 2016. The study also conducted a unit root and co-integration test that showed that a long-run relationship existed among the variables. The main findings of the study were that monetary policy rate, interest rate, and investment have insignificant positive effect on economic growth.

Umaru et al. (2018) estimated the effect of exchange rate volatility on economic growth of West African English speaking countries within the period of 1980 to 2017. The study also employed the ordinary least squares, fixed effect and random effect as an estimation technique. The data was source from the World Bank. Their results revealed that exchange rate was statistically significant and inversely related to economic growth of the West African English speaking countries.

Using the difference and system generalized method of moments as estimators; Barguellil et al. (2018) also examine the impact of exchange rate volatility on economic growth of 45 developing and emerging countries. The data used was a panel data over the period 1985 to 2015. The results from the study showed that nominal and real exchange rate volatility had a negative and significant effect on economic growth.

Kharusi and Ada (2018) also investigated external debt and economic growth nexus in Oman. The time series data employed for the study covered the period 1990 to 2015 and was source from World Bank and Central bank of Oman. After estimating the short-run and the long-run results using the ARDL model, the result revealed that external debt exerted a negative and significant effect on economic growth of Oman.

In a related study, Nwaogu and Ryan (2015) employed the dynamic spatial-lag model as an estimation strategy to examine the impact of FDI, Foreign Aid, Remittance on Economic Growth of 54 Developing Countries in Africa and 34 Latin American and Caribbean countries. Using gross domestic product as a measure of economic development, the study showed that foreign

aid and FDI affected economic growth of Africa positively. However, in Latin American and Caribbean countries, foreign aid and remittances affected growth negatively. In Bangladesh, Reza et al. (2018) also employed the vector error correction model as estimation technique to examine the impact of foreign direct investment inflow on economic growth. The study used annual time series data from the period 1990 to 2015. Using gross domestic product as a measure growth, the results from the study revealed that FDI inflow had a positive relationship with economic growth.

Regarding empirical works on lending rate and economic growth, Obamuyi et al. (2012) investigated the relationship between bank lending, economic growth and the performance of the manufacturing sector in Nigeria over the period 1973 to 2009. After testing for co-integration among the variables and estimating the parameters with the vector error correction model (VECM), the study revealed that manufacturing capacity utilization and bank lending rates significantly affected manufacturing output in Nigeria. However, the study could not establish any relationship between manufacturing output and economic growth as well as lending rate and economic growth of Nigeria.

Nasir et al. (2014) also examined the financial depth, lending rate and economic growth nexus in Saudi Arabia. The study measured financial debt by liquid liability indicator and banks claim to the private sector to GDP ratio and also measured economic growth by gross domestic product. Their estimation results from the Granger causality and Vector Error Correction Model (VECM) showed that financial depth causes lending rate.

In Ghana, we are aware of a related work by Ladime et al. (2013) who system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) as an estimation strategy to investigate the determinants of bank lending behaviour in Ghana. The study used a panel data involving 17 banks over the period 1997 to 2006. Their findings revealed that bank size and capital structure had a statistically significant and positive relationship with bank lending behaviour. In addition, the study also provided empirical evidence that the central bank's lending rate and exchange rate had a negative and significant impact on lending behavior in Ghana.

Employing the fixed-effects generalized least squares panel regression as a method of estimation Aboagye et al. (2008) also examined interest rate spreads in Ghana. The data used in the study was obtained from banks balance sheets and income statements submitted to the Banking Supervision department of the central bank. The data used in the study was a quarterly data over 2001 to 2006. Their results revealed that the net interest rate margin was significantly decreased by an increase in the central bank lending rate, management efficiency, bank excess cash reserves and the passage of time. On the other hand, an increase in bank market power, bank size, staff costs, administrative costs, extent of bank risk aversion and the rate of inflation significantly increased the interest rate margin.

From the past studies reviewed, it is observed that works on economic growth and lending rate are scanty in literature. The existing empirical works on economic growth have paid much attention to how inflation and other key macroeconomic variables affect economic growth (Salami, 2018, Mamun et al., 2018, Ufoeze et al., 2018, Chu et al., 2017, Kharusi and Ada, 2018). However, empirical works on the impact lending rate has on economic growth appears to be scanty in literature of developing countries, especially, Ghana. Given the scanty literature on the subject especially in developing countries, there is a need for empirical study and the present

study seeks to fill this literature gab. This study is differentiated from all other studies by examining examine the effect of lending rate has on economic growth in Ghana. The study employed recent data (Thus from 1970 to 2020) and used the ARDL model as an estimation strategy, which is superior and suitable for relatively small number of observations as compared to other time series methods. Further, although our empirical evidence/findings is for Ghana, economic growth is globally, hence, our findings will be relevance for developing countries with similar socioeconomic and demographic setting like Ghana. This shows that our findings/results is significant beyond Ghana's boundaries.

3. Methodology
3.1 Data type and Source

The study relied on yearly time series data spanning 1970 to 2020. Data monetary policy rate and lending rate was obtained from the Bank of Ghana database. However, data on, inflation, exchange rate and foreign direct investment were obtained from world development indicators (WDI) of the World Bank (2019) database. Detailed description of the all the variables are shown in Table 1.

Table 1: Brief description of variables

Varaible	Description	Expected effect
Lending rate(LR)	Lending rate is the rate of interest at which financial organizations and banks charge for lending money to individuals, firms and small-scale enterprises. Simply put, it the rate of interest paid on loan to financial organizations and Banks In Ghana, the average lending rate is determine by commercial banks. Hence, the commercial banks' base rate in Ghana was used as a proxy for the market lending rate, which is consistent with existing studies (Ladime et al., 2013, Matemilola et al., 2015, Burnham, 2011, Kinyuru, 2011). Data on this variable was obtain from Bank of Ghana (2019).	-
Gross domestic product(GDP)	Regarding gross domestic product, we defined it as the total final output produced in an economy or country irrespective of the nationality of the producers. Real GDP on the other hand can be defined as total services and good an economy produced at a given time period which adjust for inflation. We follow existing studies (Buabeng et al., 2019, Adabor et al., 2020, Adabor and Buabeng, 2020, Henderson et al., 2012) and measured economic growth with real GDP. The study sourced data on this variable from World development indicators (2019) of the World BanK.	?
Inflation(INF)	Inflation is also define as the increase in the general price of goods and services. We measure inflation with Consumer Price Index (CPI), which is consistent with existing studies (Bittencourt et al., 2015, Madurapperuma, 2016, Ndoricimpa, 2017). Data on this variable was also obtain from World development indicators (2019).	-
Monetary policy rate (MPR)	Monetary policy is an action or policy adopted by monetary authorities or central bank of an economy to control interest rate on short-term borrowing or money supply. The monetary policy rate is determined by the central bank of every economy depending on other macroeconomic indicator such inflation, interest rate, exchange rate, unemployment and others (Girton and Henderson, 1977, Olamide	_

	and Maredza, 2019). In this study, we used Bank of Ghana's monetary policy rate which is consistent with empirical studies in other countries.(Caraiani and Călin, 2020, Georgiadis, 2016) The study obtained data on this variable from Bank of Ghana (2019).	
Exchange rate (EXCR)	Exchange rate is well known as the value of a country's currency relative to another country's currency. This study considers the cedi/dollar exchange rate as a measure of exchange rate, which is in line with existing studies in Ghana (Immurana et al., 2013, Nyarko et al., 2011, Adjasi et al., 2008). The study obtained data on this variable from the World development indicators (2019).	_
Foreign direct Investment (FDI)	The study defined foreign direct investment as a category of cross border investments made by non-resident in the economy. FDI includes the sum total of value of reinvested earnings, value of affiliated equity and net inter-company(Alfaro and Chauvin, 2016). The study sourced data on this variable from World development Indicators (2019) of the Word Bank.	+
Treasury Bill Rate (91- day) (TBR)	Treasury bill is define as a short-term money market instrument(debt) issue by central Banks of an economy on behalf of government or on its own to take or borrow money from people for development purposes such as construction of schools, roads and extension of electricity to rural areas (Bessembinder, 2018). Treasury bill normally matures within a year or less. T-bill normally provide stable income for T-bill holders since it has fixed interest rate with zero default rate	+

3.2 Model specification

We expect gross domestic product (measuring economic growth) to depend on lending rate and other relevant variables (Nasir et al., 2014) . The functional of the model is specified in equation (1).

$$GDP = f\,(LR, MPR, FDI, INF, EXCR, TBR\,) \ldots\ldots.\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (1)$$

Where GDP is gross domestic product, LR is lending rate, MPR is monetary policy, FDI is foreign direct investment, INF is inflation, TBR is treasury bill rate and EXCR is exchange rate. The estimable form of equation (1) is specified in equation (2).

$$lnGDP_t = \beta_0 + \beta_1 lnLR_t + \beta_2 lnMPR_t + \beta_3 lnFDI_t + \beta_4 lnINF_t + \beta_5 lnEXCR_t + \beta_6 TBR + \mu_t -----------(2)$$

Where the variables GDP, LR, MPR, FDI, TBR and EXCR are explained earlier in equation (1). β_0 is the constant term and μ_t is the disturbance term. The parameters β_is (i=1, 2......, 5) are the coefficient of the respective variables.

3.3 Estimation strategy

The autoregressive distributed lag (ARDL) model and bounds test for cointegration following Pesaran et al. (2001) and the error correction model (ECM) were used to estimate the aforementioned parameters in equation (2). The ARDL model is preferred over other models because it make use of series that are strictly integrated of order zero, one or mix on the condition that the series are not integrated of order two or more and it is superior in small samples compared with other single and multivariate co-integration techniques (Narayan, 2005).

Using non-stationary variables in time series analysis may lead to inconsistent and biased estimates (Granger et al., 1974). In addition, it will result in spurious regression, which will not be suitable for making analysis. Furthermore, commercial banks' lending rate has been increasing over the sample period and therefore the ARDL model is suitable over non-linear autoregressive distributed lag (NARDL) model. Thus, the relationship between commercial banks' lending and gross domestic product is linear. Hence, the ARDL model because this is the appropriate estimate technique for the study. For stationarity test, we employed the Phillips and Perron test by Phillips and Perron (1988)[1] and the Augmented Dickey-Fuller (ADF) test by Dickey and Fuller (1979). The ADF test can be expressed as follows:

$$\Delta x_t = \gamma_0 + \delta X_{t-1} + \gamma_i \sum_{i=1}^{p} \Delta X_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where X_t is the variable under consideration at period t. The ADF and PP test are conducted with a null hypothesis of H_0: $\delta = 0$ as against an alternative hypothesis that H_1: $\delta < 0$. The null hypothesis states that there is the presence of unit root whiles the alternative hypothesis states that there is no unit root. The series become stationary when the null hypothesis is rejected.

Once we have achieved stationarity among all the variables, the ARDL is applied to estimates all the parameters in equation (2) for both long-run and short-run. The ARDL model is specified in equation (4).

$$\Delta \ln GDP_t = \alpha_0 + \sum_{t=1}^{p} \beta_1 \Delta \ln GDP_{t-i} + \sum_{t=1}^{p} \pi_1 \Delta \ln LR_{t-i} + \sum_{t=1}^{p} \eta_1 \Delta \ln MPR_{t-i} +$$

$$\sum_{t=1}^{p} \gamma_1 \Delta \ln FDI_{t-i} + \sum_{t=1}^{p} \lambda_1 \Delta \ln INF_{t-i} + \sum_{t=1}^{p} \varphi \Delta In\ EXCR_{t-i} + \sum_{t=1}^{p} \epsilon \Delta In\ TBR_{t-i} +$$

$$\delta_1 \ln GDP_{t-1} + \delta_2 \ln LR_{t-1} + \delta_3 \ln MPR_{t-1} + \delta_4 \ln FDI_{t-1} + \delta_5 \ln INF_{t-1} +$$

$$\delta_6 lnEXCR_{t-1} + \delta_7 \ln TBR_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where Δ is the first difference operator of the model. The parameters β, π,η, λ and τ represent the short-run coefficients whiles the long-run multipliers are denoted by δ_1 to δ_6, the number of lags is denoted by p whiles ε_t is white noise error term which is independent and identically distributed and α_0 is the constant term.

The ARDL co-integration test is done by testing the following hypotheses:

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[1] The PP test is specified as $\Delta Y_{t-1} = \alpha_0 + \beta_1 Y_{t-1} + \varepsilon_t$ The study tests the null hypothesis (H_0:β=0) of the existence of unit root against the null hypothesis(H_0:β≠0) of non-existence of unit root. Failure to reject the null hypothesis imply the series is non-stationary. If the null hypothesis is rejected, then the variable is stationary at the levels [I(0)].

H₀ = δ1 = δ2 = δ3 = δ4 = δ5 = δ6=0; (there is no co-integration. Thus, no long run relationship between the variables).

H₁ = δ1 ≠ δ2 ≠ δ3 ≠ δ4 ≠ δ5 ≠ δ6=0 (there is co-integration or long run relationship between the variables).

The hypothesis is tested using the F-statistic. H₀ represents the null hypothesis whiles the H₁ represents the alternative hypothesis. It primarily tests for the hypothesis of no long-run relationship using the ARDL methodology. If the calculated F-statistics is more than the upper critical value, the null hypothesis of no long-run relationship is rejected otherwise it is accepted. However, if the F-statistic lies between the lower and the upper bound critical values, the result cannot be concluded.

The error correction model is also employed in this study to measures the degree of deviation of the independent variables from equilibrium. In addition, the error correction model helps in reconciling the economic variables under consideration when there is a deviation in the behavior in the short-run. The general error correction model is specified as follows:

$$\Delta X_t = a_0 + \sum_{i=1}^{p} \beta_i \Delta X_{t-i} + \sum_{i=1}^{q} \gamma_i \Delta Y_{t-i} + \delta ECM_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where X represents the dependent variable with its lags and y represents a list of independent variables with their lags, Δ denotes the first difference operator, whiles β and γ are the short run dynamic coefficients of the model. In addition, ECM_{t-i} is the error correction term. Statistically, the ECM must have a negative sign and must be statistically significant. δ is the parameter which indicates the speed or shows the speed of adjustment to long run equilibrium after a shock in the short-run.

Lastly, we employed the Toda and Yamamoto (1995) approach to examine the causal relationship among all the variables with much attention on the causative relationship between lending rate and economic growth. Although the Toda and Yamamoto (1995) uses the modified wild test, it is similar to ARDL bound test which do not need pretesting of the variables in order to determine the order of the integration before it can be applied. Toda and Yamamoto (1995) approach follow a vector auto regressive (VAR) approach in level and then the appropriate VAR order K is augmented by the maximum integration order (d) of all the variables in the model. To obtain the causal results, we estimated the parameters of the following VAR (k+d) models as specified below:

$$\ln GDP_t = \pi_1 + \sum_{i=1}^{k} \beta_{1i} \ln GDP_{t-i} + \sum_{j=k+1}^{d} \beta_{2j} \ln GDP_{t-j} + \sum_{i=1}^{k} \beta_{3i} \ln LR_{t-i}$$

$$+ \sum_{j=k+1}^{d} \beta_{4j} LR_{t-j} + \sum_{i=1}^{k} \beta_{5i} \ln MPR_{t-i} + \sum_{j=k+1}^{d} \beta_{6j} \ln MPR_{t-j}$$

$$+ \sum_{i=1}^{k} \beta_{7i} \ln FDI_{t-i} + \sum_{j=k+1}^{d} \beta_{8j} \ln FDI_{t-j} + \sum_{i=1}^{k} \beta_{9i} \ln INF_{t-i}$$

$$+ \sum_{j=k+1}^{d} \beta_{10J} \ln INF_{t-J} + \sum_{i=1}^{k} \beta_{11i} \ln EXCR_{t-i} + \sum_{j=k+1}^{d} \beta_{12j} \ln ECXCR_{t-j}$$

$$+ \sum_{i=1}^{k} \beta_{11i} \ln TBR_{t-i} + \sum_{j=k+1}^{d} \beta_{12j} \ln TBR_{t-j}$$

$$+ \mu_{1t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots .. \dots \dots \dots .. (6)$$

Where π_1 is the constant, the optimal order of the VAR model is K, which we determined it by the Schwarz information caterion, the maximum integration order is d and μ_i are the white error term in the VAR system.

4 Empirical results and discussion

In this section, we present the empirical results from the ARDL estimations. First, we present a summary descriptive statistics of all the variables employed in the study. This is followed by the results from the unit roots and the co-integration test. Lastly, we present discussions on the long- and short run estimates as well as the diagnostic test results.

Table 2: Descriptive statistics

Variable	Observation	Mean	Std. Dev.	Min.	Max.	Skewness	Kurtosis
lnLR	50	3.205	0.132	2.921	3.447	0.220	0.818
lnMPR	50	2.854	0.234	2.525	3.258	0.394	1.046
lnFDI	50	1.119	1.024	1.381	2.253	1.024	0.843
lnINF	50	2.030	0.434	1.023	2.965	0.513	2.280
lnGDP	50	1.642	0.355	1.194	2.642	0.355	0.073
lnEXCR	50	1.137	1.219	0.033	4.351	1.269	1.234
lnTBR	50	2.881	0.351	2.212	3.325	0.112	0.866

Note: N and Std represents number of observation and standard deviation respectively. We took natural logarithm of all the variables to enables us account for the difference in magnitude of the variables due to the different means and unit of measurement.

Table 2 show the descriptive statistics of all the variables used in our study. Lending rate had a minimum value of 2.921 and a maximum value is 3.447. Lending rate also averaged at 3.205 whiles its deviation from the mean is 0.135. Monetary policy rate variable also averaged at 2.854 with a minimum value of 2.525 and a maximum value of 3.258. It also had a standard deviation of 0.234. For foreign direct investment, the maximum and the minimum values were 2.253 and 1.381 respectively with an average of 1.119. The deviation of foreign direct investment from its means is 1.024. Additionally, the average inflation rate was 2.030 and with a minimum and

maximum values of 1.023 and 2.965 respectively. It also had a standard deviation of 0.434. Gross domestic product also averaged 1.642 with minimum and maximum values of 1.194 and 2.642 respectively. Exchange rate averaged 1.137 and ranges between 0.033 and 4.351. Exchange rate also had a standard deviation of 1.219. The result for the treasury bill rate follow the same interpretation.

Regarding the skewness and Kurtosis, all the variables are positively skewed with fatter tails at the end. Furthermore, by the rule of thumb of Kurtosis, average lending rate, monetary policy rates, foreign direct investment, inflation rate, gross domestic product, exchange rate and treasury bill rate were normally distributed with values of 0.818, 1.046, 0.843, 2.280, 0.073 and 1.2341 respectively.

4.2 Unit root and co-integration test results
In this section, we present the results from The Philip-Perron (PP) and Augmented Dickey Fuller tests. Table 3 display the results. We find that lending rate (LR), monetary policy rate (MPR), foreign direct investment(FDI) and exchange rate(EXR) were all integrated of order one I(1) whiles gross domestic product (GDP), inflation (INF) and treasury bill rate(lnTBR) were integrated of order one I(0) series. The implication of this result is that we can apply the ARDL bounds test to examine the long relationship between gross domestic product and lending rate in Ghana.

Table 3: Unit root estimates for both the (ADF) and (P-P) test

Variables	ADF test with intercept			PP test with intercept		
	Level	1st difference	I(d)	Level	1st difference	I(d)
lnGDP	-3.095**	6.816***	I(0)	-3.611**	6.562***	I(0)
lnLR	1.6460	-6.435***	I(1)	-1.546	-4.275***	I(1)
lnMPR	-2.732	-3.005***	I(1)	-1.739	-4.275**	I(1)
lnFDI	-2.648	-4.342***	I(1)	-2.325	-5.315**	I(1)
LnINF	-3.449*	-5.362***	I(0)	-3.128**	-5.667***	I(0)
lnEXCR	-1.484	-3.990**	I(1)	-1.656	-4.943**	I(1)
lnTBR	4.111**	6.555***	I(0)	5.002**	6.091**	I(0)

Note: Augmented Dickey Fuller and Philip-Perron (PP) tests results for all the variables used in our analysis. ***, **, and * represent significance at 1%, 5% and 10% respectively.

Co-integration test results

Table 4 Bounds test estimates

Dependent variables	F-$_{statistics}$	K=5	
(1a)F$_{GDP}$(GDP|LR,MPR,FDI,INF,EXCR,TBR)	15.37689		
(2a)F$_{GDP}$(GDP|LR,FDI, INF,EXCR,TBR)	10.045		
(3a)F$_{GDP}$(GDP|LR,MPR,INF,FDI,EXCR)	12.4		
(4a)F$_{GDP}$(GDP|LR,FDI, INF, EXCR)	11.2		
Critical Value		Lower bound	Upper bound
1%		6.11	7.01

| 5% | | 5.39 | | 9.38 |

After establishing that the variables are mixture of I(1) and I(0) series, we applied the ARDL bound test approach to examine the existence of co-integration among the variables. We specified four different equation via varying the control variable to allow for sufficient degree of freedom. From Table 4, the result of the bounds test showed that all the computed F-statistics for all the equations are greater than the upper bound critical value at 5% level of significance. We can therefore conclude there is the existence of a long run association or co-integration among the variables. We can therefore proceed to estimate the long run effect of lending rate on economic growth of Ghana since the bound test results provide sufficient evidence to support the existence of long run association among the variables.

4.3 Estimated results for both long-run and short-run coefficients.

Table 5: Estimated long-run coefficients

Variable	(1a)	(2a)	(3a)	(4a)
lnLR	-0.150**	0.170***	0.273**	0.409**
	(0.015)	(0.0430)	(0.045)	(0.052)
lnMPR	-0.503***		0.140**	
	(0.060)		(0.026)	
lnFDI	0.130***	0.165**	0.297**	0.151*
	(0.023)	(0.032)	(0.039)	(0.047)
lnINF	-0.484***	0.928**	0.183*	0.470**
	(0.050)	(0.064)	(0.045)	(0.151)
lnEXCR	0.338***	0.842**	0.231**	0.301
	(0.057)	(0.140)	(0.041)	(0.251)
lnTBR	0.732**	0.141**		
	(0.100)	(0. 033)		
Constant	2.421*	4.223**	0.821	2.195*
	(0.821)	(0.221)	(1.0128)	(0.614)

The specifications in Table 5 are line with specifications in Table 4. Thus, Table 5 displays estimation of the specific equations in Table 4. In all the model [(1a)-(4a)] lending rate exerts negative and significant impact on economic growth which somewhat confirms the consistent and reliability of our estimates in the long run. As a result, our discussions focused on the result obtained from estimating model (1a) since the signs and the significant levels for the control variables are also similar in all the models.

Consistent with prior expectation, we find that the variable of interest (lnLR) in model (1a) had a negative and significant relationship with gross domestic product (lnGDP) as shown in Table 5. Specifically, the result revealed that one percent increase in lending rate will decrease gross domestic product by 0.15 percent in the long-run in Ghana. The economic intuition behind this result is that higher lending rate increases cost of borrowing from commercial banks in Ghana. Since economic growth is motivated by availability of enough capital accumulation, borrowing from commercial banks in Ghana can increase firms' investment to meet its minimum capital requirement for expansion. Therefore, higher lending rate implies an increase in the cost of acquiring new capital by a firm. This thereby limits the potential ability of a firm to expand in order to increase the total output produced. Thus, higher lending rate reduces investment and since investment is a component of gross domestic product, economic growth will also be reduced. Regarding the impact on consumers, high lending rate reduces income due to higher cost of borrowing. Reduction in disposable income reduces individual's purchasing power and this will reduce consumption by individuals. A gain, since consumption is part of gross domestic product, when consumption reduces economic growth will also reduce all else being equal. The resulta is consistent with the findings by HUIDUMAC PETRESCU and Pop (2015) for Romania. However, Obamuyi et al. (2012) found a positive result for the case of Nigeria.

Regarding foreign direct investment and economic growth, the study found a positive and significant relationship at one percent level of significance as shown in model (1a). The positive coefficient of 0.1322 implies that one percent increase in foreign direct investment will cause 0.13 percent increase in economic growth in the long-run. Foreign direct investment inflow promotes economic growth by encouraging the expansion of local firms as well as the establishment of new multinational cooperation, which boost investment. In addition, inflow of FDI also increases infrastructure development such as roads, public health, and extension of electricity supply to promote economic growth. This result is comparable to that of Nketsiah and Quaidoo (2017) but contradict that of Mwinlaaru and Ofori (2017) which are all studies in Ghana.

Theoretically, exchange rate is expected to contribute negatively to economic growth. However, the long-run results showed a positive and a significant relationship between exchange rate and gross domestic product at one percent level of significance. Specifically, in model (1a), if the country experience one percent depreciation in exchange rate, economic growth measured by gross domestic product will decrease by approximately 0.34 percent in the long-run. The economic implication of this result is that higher exchange rate increases the demand for domestic goods as the importation of foreign goods becomes relatively expensive. Profit maximizing local firms will increase their output to meet the demand on the market thereby increasing total gross domestic product. Thus, depreciation of the local currency makes the economy internationally competitive. This finding is consistent with the findings by Adewuyi and Akpokodje (2013).

Furthermore, the result revealed that inflation exerts a negative impact on the economic growth of Ghana at one percent level of significance as shown in model (1a). Specifically, if the general price level increases by one percent, gross domestic product will decrease by 0.49 percent in the long-run. The implication of this result is that an increase in inflation will increase the cost of raw materials and other inputs used in production by firms. In addition, inflationary effect

decreases consumer's purchasing power. This reduces their demand for goods and services thereby reducing total gross domestic product. This result confirms the findings of Nketsiah and Quaidoo (2017) and in a related study on inflation, exchange rate, foreign direct investment and economic growth of Ghana.

The study found a negative and significant relationship between monetary policy rate and gross domestic as expected. Thus, monetary policy rate exerts a negative impact on gross domestic product at one percent level of significance as shown in model (1a). Specifically, one percent increase in monetary policy rate will result in 0.50 percent decrease in gross domestic product all other things being equal. This implies that an increase in monetary policy rate increases cost of borrowing from commercial banks and this reduces investment and consumption thereby reducing gross domestic product. This result is contrary to that of Onyeiwu (2012) who used ordinary least square to examine monetary policy and economic growth nexus in Nigeria.

Lastly, we also find a positive and significant relationship between treasury bill rate and economic growth at 5% level of significant as shown in model (1a) in Table 5. The coefficient of 0.732 implies that one percent increase in treasury bill rate generates approximately 0.73 percent increase in gross domestic product of Ghana, all else equal. The economic implications of this findings is that increase in treasury bill rate enable government to increase spending on developmental projects such as roads, hospital and school construction, via taking or borrowing enough money from people and paying it at a future date.

Table 6: Estimated short-run results

Variable	(1a)	(2a)	(3a)	(4a)
ΔlnLR	-0.1129***	-0.215**	-0.098**	-0.052*
	(0.0223)	(0.022)	(0.021)	(0.017)
ΔlnLR(-1)	-0.0655**	-0.114**	-0.078*	-0.039*
	(0.0255)	(0.026)	(0.021)	(0.011)
ΔlnFDI	0.258***	0.576**	0.406	0.967**
	(0.073)	(0.0731)	(0.398)	(0.098)
ΔlnFDI(-1)	0.295***	0.381**	0.306	0.737**
	(0.062)	(0.042)	(0.298)	(0.078)
ΔlnEXCR	0.8196***	0.410**	0.210**	0.0519**
	(0.162)	(0.024)	(0.036)	(0.034)
ΔlnEXCR(-1)	0.1376**	0.242**	0.110**	-0.420**
	(0.042)	(0.036)	(0.016)	(0.052)
ΔlnINF	-0.6419***	-0.511**	-0.411**	-0.938**
	(0.108)	(0.041)	(0.041)	(0.058)
ΔlnINF(-1)	-0.5384***	-0.413*	-0.211**	-0.754**
	(0.113)	(0.098)	(0.021)	(0.031)
ΔlnMPR	-1.090***		-0.601**	
	(0.205)		(0.051)	
ΔlnMPR(-1)	-0.804***		-0.411**	
	(0.235)		(0.051)	
ΔlnTBR	0.313**	0.345**		
	(0.035)	(0.051)		

ΔlnTBR(-1)	0.258**	0.821		
	(0.040)	(0.913)		
ECM (-1)	-0.3646***	-0.150**	-0.111**	-0.244**
	(0.0503)	(0.012)	(0.011)	(0.041)
R-square	0.9493	0.891	0.966	0.878
Adjusted R-square	0.8255	0.789	0.899	0.798
Durbin-Waston test	2.278	3.110	3.101	
F-statistic	13.779	10.123	11.981	
Prob (F-statistics)	0.000	0.002	0.003	0.001

Source: Authors elaboration based on World Bank (2017) and Bank of Ghana (2017) data. The dependent variable is gross domestic product (GDP) and the variables of interest is lending rate (LR). Our control variables include exchange rate, foreign direct investment, inflation and monetary policy rate. *** represent significant levels 1% , ** represent 5% and * represent 10% level of significance. We selected a lag order of the ARDL model ARDL(0, 1,1,1,1, 1) based on the Schwarz information criterion.

The short-run results are not statistically different from those obtain from the ling-run in terms of signs and significance level for the four models. Also, in all the models [(1a)-(4a)] lending rate had negative and significant effect on economic growth which somewhat confirms the consistent and reliability of our estimates in the short run. As a result, our interpretations focused on the result obtained from estimating model (1a) since all the signs and significance level are approximately the same.

From Table 6, lending rate had a coefficient of -0.1129, which means that one percent increase in lending rate will result in 0.1129 percent decrease in gross domestic product, holding all other variables constant. This implies that increase in lending rate reduces economic growth of Ghana. The first deference of lending rate also had the same empirical relationship with gross domestic product. This implies that previous year's lending rate had a negative effect on economic growth of Ghana. For foreign direct investment, it had a positive relationship with gross domestic product in the short-run as shown in model (1a). Specifically, a one percent increase in foreign direct investment will result in 0.25 percent increase in gross domestic product, holding all other variables constant. The inflow of foreign direct investment leads to the expansion of local firms and setting up new multinational cooperation as well as expansion of infrastructure in the economy to increase investment. This thereby promotes economic growth in the short-run. For model (1a), the study also found that exchange rate has a positive and a significant effect on economic growth in the short-run. Thus, the coefficient of 0.8196 implies that if the country experience exchange rate depreciation by one percent gross domestic product will increase by 0.81 percent in the short-run, holding all other variables constant. Furthermore, the results also revealed that inflation exerts a negative impact on gross domestic product in the short-run. Thus, inflation has a significant and inverse relationship with gross domestic product at one percent level of significance as shown in model (1a). Specifically, one percent increase in general prices of goods and services will result in 0.64 percent decrease in gross domestic product all else being equal. Additionally, monetary policy rate also had a negative and significant relationship with gross domestic product in Ghana. Its coefficient of -1.0902 in model (1a) implies that 1 percent increase in monetary policy rate will lead to 1.09 percent increase in gross domestic product in the short-run, holding all other variables constant. Lastly, we find that both the current the lag value of treasury bill rate had a positive and significant effect on economic growth of Ghana. Specifically, the coefficient of the current value of treasury bill implies one percent increase in

treasury bill generates approximately 0.313 increase in economic growth, holding all others factors constant.

The error correction term [ECM (-1)] in model (1a) illustrates the speed of adjustment which portrays the endogenous responds to shocks of the dependent variables. The coefficient of the ECM is -0.3646. This implies that co-integration and stability exist among the variables in the model. Therefore, there is a one percent significance level of stability in the model and equilibrium in the long-run will adjust by approximately 36 percent annually after any short-run shock.

**4.4 Testing the validity and reliability of the estimates from the ARDL Model**

Table 7: Diagnostic and reliability test results

Diagnostic test	Test Statistics	Prob. Value
Normality	0.4014	0.8181
Serial correlation	2.1535	0.1721
Heteroskedasticity	0.7422	0.7047
Functional form	0.2311	0.1201
CUSUM	Stable	
CUSUMQ	Stable	

Note: We reported the results of the diagnostic test for only model (1a) to avoid repeating similar results and to utilize space.

To ensure that our estimations from the ARDL have no statistical, econometric problems and more reliable, we carried out a diagnostic and reliability test for all the models (1a-4a). The results are reported in table 6 above are for model (1a) since estimates from model (2a) shown similar results. From the diagnostic and reliability, it was revealed that the ARDL model is free from econometric and statistical problems since all the probability values for all the test is greater than 5 percent significance level. In addition, the CUSUM and CUSUMSQ graph (see the figure 3 below) also revealed that gross domestic product over the period of 1990 to 2019 is stable. This is because the plots of the cumulative sum and cumulative sum of square lie within the 5 percent critical bound.

Figure 3: Plots of the cumulative sum and cumulative sum of square
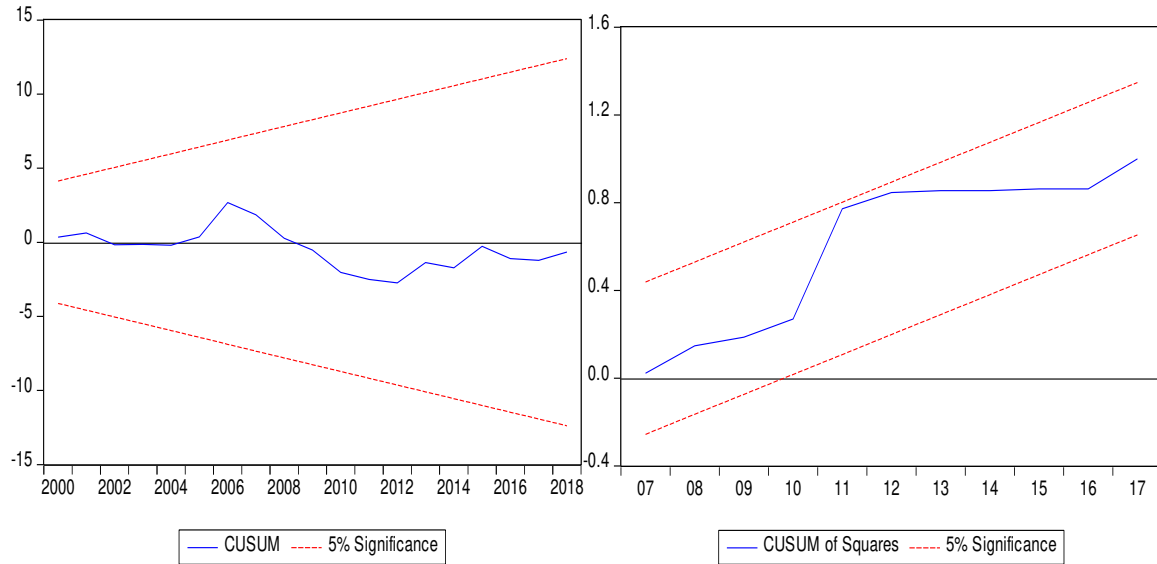
Table 8:Toda and Yamamoto (1995) causal analysis

Regressors	lnGDP	lnLR	lnFDI	lnMPR	lnINF	lnEXCR	TBR	Direction of Causality
lnGDP	-	0.0113	9.125***	0.556	2.176	0.3830	0.245	FDI ⟷ GDP
lnLR	5.036***	-	1.110	0.301	0.058	2.073	0.110	GDP ⟶ LR
lnFDI	6.041**	1.011	-	0.806	0.071	1.103	0.981	GDP ⟷ FDI
lnMPR	0.403	0.972	0.431	-	0.521	0.761	8.122**	TBR ⟶ MPR
lnINF	1.120	7.035**	0.263	0.665	-	0.145	5.8911**	LR ⟶ INF
lnEXCR	1.270	0.150	0.681	1.0724	7.023**	-	2.110	INF ⟶ EXCR
lnTBR	1.234	1.232	2.110	1.124	9.012**	2.1011	-	INF ⟷ TBR
Autocorrelation	test							
LM stat	14.9214	Prob.	0.5001					

Note: To utilize space we only reported the T-statistics. *** represent significant levels 1% , ** represent 5% and * represent 10% level of significance

To obtain the causal relationship among the variables the study estimated equation (6) after the bound test results shown sufficient evidence of co-integration among the variables. The result form the Toda and Yamamoto (1995) are displayed in Table 8. We find a bidirectional causal relationship between foreign direct investment and economic growth. The economic implication of this finding is that, on one hand, increase in economic activities of a country can attract foreign direct investment inflows, which can further increase economic growth. On the other hand, when inflow of foreign direct investment inflow to a country increase, it will automatically increase investment and consumption to influence economic growth. Unidirectional causality between gross domestic product and commercial banks' lending rate was also detected with gross domestic product driving lending rate, without feedback. This finding implies that as economic activities of an economy expands, firms and individual borrow more money for investment and consumption purposes. This can exert enough pressure on lending rate causing a

persistent increase in lending rate over time in a country. The study also find a unidirectional causality running from treasury bill rate to monetary policy rate. Further, we also find a strong influence of lending rate and inflation on inflation and exchange rate respectively, and not vice versa. Lastly, bidirectional causality was also found between inflation and treasury bill rate.

5. Conclusions and policy recommendations

An increasing number of studies have examined the effect of lending rate on economic growth. This area of empirical search is motivated by the fact that lending rate is one of the main factors that accelerate of economic growth via investment and consumption. The literature that examines the relationship between lending rate and economic growth, largely focused on the linear relationship between lending rate and economic growth without conducting a robust analysis. Relatively speaking, much less is known about the causal relationship between economic growth and lending rate. This study investigated the impact of lending rate on economic growth of Ghana by employing autoregressive distributed lag model (ARDL) and Toda and Yamamoto (1995) causal approach which were appropriate for a monthly time series data (from 1990-2017). Novel contribution to literature includes robust analysis of the impact of lending rate on economic growth and the use of the right econometric strategy for the estimation of monthly time series data model as well as the causal analysis between economic growth and lending rate in Ghana.

We find a significant negative relationship between lending rate and economic growth of Ghana. Our finding implies that when lending rate increases, it discourages borrowing from commercial banks in both the long-run and the short-run which decreases gross domestic product. From the causal analysis, we find unidirectional causality running from gross domestic product to lending rate, without feedback. This finding implies that as an economy expands in terms of economic activities, firms and individual borrow more money for investment and consumption purposes. For foreign direct investment and economic growth, the study also found a significant and positive relationship in both the long-run and the short-run. Thus, increase in foreign direct investment inflow promotes economic growth because it will result in expansion of local firms and setting up of new multinational co-operations. Regarding exchange rate, a depreciation of Ghanaian cedi will results in an increase in economic growth both in the long-run and the short-run. Furthermore, the results revealed that an increment in general prices of goods and services in Ghana will lead to a decrease in economic growth in both the long-run and short-run. Finally, the results also revealed that the monetary policy variable had a significant and an inverse relationship with economic growth in both the long-run and the short-run.

Following the findings of this study, the study has vital policy recommendations for developing countries especially those in sub-Sahara Africa with similar socioeconomic and demographic setting like Ghana, which are at the same developing stage with Ghana. First, since higher lending rate does not promote economic growth, the study recommends that the government, commercial banks and central bank should collaborate to produce an effective strategy of reducing and stabilizing the lending rate over a long period to encourage firms, individuals and other institutions to borrow from commercial banks in Ghana. Moreover, the monetary authorities should work closely with commercial banks to ensure effective supervision and

management of these banks to decrease and maintain the stability of the lending rate. Overall, policies that aim at stabilizing lending rate over a period time will increase investment to accelerate economic growth of developing countries especially countries.

In addition, given the negative relationship between monetary policy rate and economic growth, the study also recommends that monetary policy authorities should work with commercial banks and other private institutions to engineer an effective mechanism of reducing and stabilizing the monetary policy rate. Furthermore, the study recommends that, the central bank should strengthen its inflation targeting policy to be able stabilize inflation over a long period since the study has revealed that an increase in inflation does not promote economic growth. Lastly, exchange rate had a negative impact on economic growth, therefore the study recommends that the government, monetary authorities and other private institutions must work together to manage and stabilize exchange rate over a long period of time. Stabilizing lending rate, inflation, monetary policy rate and exchange rate over a long period will ensure a stable macroeconomic environment, which will attract foreign direct investment to promote economic growth of Ghana. Overall, government and monetary authorities should promote policies that increase the inflow of foreign direct investment in Ghana while taming inflation, exchange rate, monetary policy, lending rate and treasury bill rate towards growth enhancing targets.

Our strength cometh From God……………………….

Compliance with ethical standards Conflict of interest: The authors declare that they have no conflict of interest.

Data source

Bank of Ghana: https://www.bog.gov.gh/monetary-policy/policy-rate-trends/

World Development Indicators: https://databank.worldbank.org/source/world-development-indicators

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