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Monetary policy and economic growth in Ghana: Does financial development matter?

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Abstract: The link between financial development and monetary policy has received considerable attention in many African countries but empirical evidence on the link has been mixed. By the use of the Autoregressive Distributed Lag (ARDL) approach, this study investigated whether financial development influences the effectiveness of monetary policy and assessed their joint effect on economic growth in Ghana for the period 1980 to 2016. The results revealed that financial development strengthens the effectiveness of monetary policy on economic growth in Ghana. The study therefore recommended that Bank of Ghana should further deepen financial sector development and improve on the competitiveness of financial markets in order to improve on the capacity of monetary policy in enhancing growth of the economy.

Subjects: Economics and Development; Economics; Finance; Business, Management and Accounting

Keywords: Autoregressive distributed lags; economic growth; financial development; monetary policy; output; Ghana

1. Introduction

Financial development has received considerable attention in recent times with high debates in development, financial as well as monetary economics following the global financial crisis that was experienced in 2008. The health of an economy in transmitting the effects of monetary policy action on growth has been identified to depend mostly on the development of the financial sector and the

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PUBLIC INTEREST STATEMENT

This paper investigates the effect of monetary policy on the economic growth of Ghana by examining how monetary policy actions successively work through the financial sector to influence economic outcomes in Ghana. To achieve this, we interacted monetary policy and financial development and observed its effect on the output of Ghana. We find that, for Ghana, the development of the financial sector enhances the ability of monetary policy action in influencing growth. We advocate for deliberate efforts to deepen the financial sector and improve the competitiveness of financial markets so as to foster delivery of monetary actions via the outlay of greater financial services in the country to spur growth.

totality of the financial makeup of a country, with the financial system acting as the medium through which monetary policy impacts the real economy (Carranza et al., 2010; Ma & Lin, 2016; Mishra et al., 2012). It is therefore expected that any development that affects the structure of the financial system will have the potential to impact the monetary transmission as documented by Carranza et al. (2010).

Ghana, like most developing countries, has been augmenting it growth process with policies aimed at strengthening monetary policy effects on output via financial sector development. This is evidenced by the works of Abradu-otoo, Amoah and Bawumia (2003), Kovanen (2011), Adu et al. (2013), Quartey and Afful-Mensah (2014), and Ofori-Abebrese et al. (2017). This notwithstandingan inevitable question that stands out is: whether the adoption of the mix of financial sector reforms has moderated monetary policy effects on economic growth. In view of this, this paper investigates the relationship between financial development and monetary policy in influencing output. The effects of monetary policy on output vary for different countries due to differences in financial structures, hence an investigation in the context of Ghana is very essential. The paper further assesses the joint or interaction effect of financial development and monetary policy on economic growth of Ghana. Again, since the conduct of monetary policy is believed to be sorely a financial phenomenon, an investigation into the joint effect of monetary policy and financial development on output is of vital essence since the inadequacy of such analysis can result in serious policy consequences. As a contribution to the literature, this study uses a new measure of financial development, the global financial development index, suggested by Svirydzenka (2016) as a measure of financial sector development unlike other studies that adopted one or two measures of financial development (see, Levine & Zervos, 1998; Pesaran et al., 2001; Gillman & Harris, 2004; Kemal, Qayyum & Hanif, 2007; Odhiambo, 2008). This measure of financial development is more robust because it captures the depth, access, efficiency and stability of the financial sector. Methodology wise, it was built on nine indices that summarize the development of financial institutions (banks, insurance companies, mutual funds, and pension funds) and financial markets (stock and bond markets) in terms of their depth, access and efficiency (Svirydzenka, 2016).

The rest of the paper is arranged as follows: the next section arrays the history of financial, monetary and output trends in Ghana. Section three covers review of related literature. Section four presents the methodology of the study; Section five conveys the discussion and analysis of empirical results and Section six focuses on the conclusions and policy implications.

2. Financial, monetary and growth trends in Ghana: A historical prelude

Ghana's financial sector has seen tremendous transformations with the introduction and adoption of different programs in the sector. Among the structural organograms of the financial program sets adopted by the country and advanced in literature are the four-era financial sector decomposition (the colonial era, the centrally controlled economy of the post-independence era, the structural adjustment, liberalization and bank reform era and the second generation reform era) advanced by Mensah (2017).

The post-independence era saw some development in the financial sector including the establishment of the Central Bank (Bank of Ghana) in 1957, GBC Bank to increase competition, effectiveness and augment the existing British banks that is, the British Bank of West Africa (now Standard Chartered Bank) and the Colonial Bank (now Barclays Bank), National Investment Bank in 1963, Agricultural Credit and Cooperative Bank in 1965, Bank for Housing and Construction and Merchant Bank in 1972 and emergence of rural banking in 1976 (Mensah, 2017). Monetary policy over the period was through the use of direct controls. Bank of Ghana used direct credit system, with maximum credit interest rates given to particular sectors of the economy, credit allocations were imposed and dictated, interest rate controls and credit ceilings were used to allocate credit to state-owned enterprises and government-imposed priority sectors like manufacturing (Antwi-Asare & Addison, 2000; Bawumia, 2010; Mensah, 2017). This led to a number of restrictive policies including heavy taxation of the banking sector as a revenue source and high reserve requirements creating distortions of high inflation on the macroeconomic front, huge accumulations of non-performing debt

and negative real interest rates (see, Antwi-Asare & Addison, 2000; Bawumia, 2010; Mensah, 2017). The financial system become repressed by 1982 (McKinnon, 1973) and by 1983, there was financial disintermediation with many Ghanaians holding currency instead of deposits at banks and informal finance saw significant growth (Antwi-Asare & Addison, 2000).

The period saw a downward turn of growth rates from 4.41% in 1961 to −4.25% in 1966 and continued to −4.56% in 1983. In 1983, the government with the support of the World Bank and the International Monetary Fund (IMF) introduced the Economic Recovery Program (ERP) in 1983 and the Structural Adjustment Program (SAP) in 1986 to restructure the economy and reverse the trends of economic decay. The economy was gradually liberalized with price and distributional controls removed and by 1987, interest rates were duly liberalized except for savings deposit. A Financial Sector Adjustment Program (FINSAP) was introduced in 1987 to complement the ERP/SAP. The FINSAP was implemented under two World Bank Credits namely the Financial Sector Adjustment Credit (FINSAC 1 and 2). FINSAC 1 covered the period 1987 to 1992 and had the enhancement of soundness of banking institutions by reforming their regulatory framework and restructuring the distressed financial institutions, deposit mobilization and credit allocation and developing money and capital markets as its priority. By the end of FINSAC 1 banking system was stabilized (Mensah, 2017). FINSAC 2 covered the period 1992 to 1997 to reduce the cost of intermediation and strengthening of the central bank in its statutory autonomy, financial condition, and institutional capacity. The Non-Bank Financial Institution (NBFI) Assistance Project also commenced in 1996 to 2002 to diversify the financial system beyond the traditional bank intermediation. The economy recovered from the negative growth to a positive growth of 8.6% in 1984 (Alagidede et al., 2013).

In spite of the success chalked by the FINSAP and NBFI project reforms, the financial sector was confronted with issues such as high interest rate environment, inadequate credit information system, lack of long-term debt market, inadequate document that support financial transactions and many of the laws including the Exchange Control Act, the Banking Law, the Insurance Law, the financial Institutions Law, and the Bills of Exchange Art to mention but a few that were governing the sector were outmoded (Mensah, 2017). The Financial Sector Strategic Plan (FINSSP) was therefore introduced in 2003 to promote a balanced financial system with both bank and non-bank component. The FINSSP was also implemented in two phases, the first phase (FINSSP I) covered the period 2003 to 2011 and saw reforms such as Securities and Exchange Commission Regulations (2003), Venture capital Trust Act (2004), Bank of Ghana Act (2004), Foreign Exchange Act (2006), Insurance Act (2006), Credit Reporting Act (2007), Central Securities Reporting Act (2007), National Pensions Act (2008), Non-Bank Financial Institutions Act (2008) and the Borrowers and Lenders Act (2008). The FINSSP II focused on the development of the bond market. The period 2001 to 2016 saw an improvement in the performance on the macroeconomic front. The economy continued to grow with a growth rate of 6% in 2005 and 14% in 2011.

According to Kwakye (2012), the country practiced monetary targeting where money supply was set as a target with inflation as the main objective and growth as a secondary goal until 2007 but limited success was achieved. Monetary authorities then switched to Inflation-Targeting (IT) where the central bank uses its policy rate (PR) to target inflation directly. Bawumia (2010) reported that, throughout the history of monetary policy frameworks adopted and practiced in the country since independence, the IT framework has proved to yield the best performance in terms of macroeconomic indicators.

3. Review of related literature

Theoretically, the effects of monetary policy on output and prices operate through the financial system. For instance, Bernanke and Gertler (1995) observed the credit channel monetary policy transmission as the strongest mechanism in predicting frictions in the financial system. They also observed an increased effect of monetary policy on the real economy. The degree of financial sector development is considered important in explaining the effect of monetary policy in an economy since

the efficacy of monetary policy crucially depends on the structure and condition of the financial system Carranza et al., 2010; Ma & Lin, 2016; Mishra et al., 2012). Garcia and Liu (1999) argued that a well-functioning financial sector is a powerful engine of economic growth since it generates domestic savings, which in turn leads to productive investments in local businesses. Levine et al. (2000) added that financial sector development plays a huge role in economic development by promoting economic growth through capital accumulation and technological progress. According to a report issued by DFID in 2004, financial development mobilizes and pool savings, produce information about investment, facilitate and encourage the inflows of foreign capital, as well as optimize the allocation of capital. Literature has also shown that countries with better developed financial systems tend to grow faster over long periods of time (Levine et al., 2000).

Empirically, a number of researchers have looked into the financial development and monetary policy effect. Some of the studies on the subject matter incorporated various measures of financial development. For instance, Krause and Rioja (2006) adopted the generalized method of moments (GMM) estimation technique to test the financial development and monetary policy link for 37 industrialized and developing countries for the period 1985 to 1998. The authors employed three indicators: private credit, liquid liabilities, and a financial aggregate index made up of banking and stock market measures to capture financial development. They concluded that more developed financial markets significantly contribute to more efficient monetary policy implication in an economy. Carranza et al. (2010) adopted overall size and depth of financial intermediaries, level of activity in the stock market and relative size of the central bank to capture financial development and analyze the link between financial development and monetary policy for 53 countries covering the period 1986 to 2005. They used a Non-hierarchical Cluster Analysis, Dynamic Panel and VARIMAX as estimations and found that monetary policy has a larger impact on the economies under review when the financial system is developed and the impact is even greater for economies with small central banks. Employing monthly data, Singh (2011) examined the pass-through effect, as well as the asymmetric response of policy interest rates to financial markets in India for the period March 2001 to October 2011. The author adopted the framework of distributed lag model and found that short end of the financial market displays a significantly high instantaneous pass-through in response to changes in the monetary policy rates. The findings also revealed that the prevailing liquidity conditions in financial markets also play an important role in conditioning the pass-through of policy rate changes to short end of the financial market. However, bank deposit and lending rates exhibited relatively longer lags in transmission. Significant asymmetry of transmission of policy rate changes during the surplus and deficit liquidity conditions, particularly at short end of financial markets was also found via using Vector Autoregressive (VAR) model.

Batuo and Mlambo (2012) examined the financial development and monetary policy link for 53 African countries for the period 1985 to 2010. They adopted Treatment Effect, Two Step Method and Panel Probit Method as estimation techniques. The results showed that banking crises have negative impact on economies and financial liberalization tends to reduce banking crises. Therefore, the more the economy is liberalized the more positive impact it has on growth. Safdar and Khan (2013) also analyzed the financial development and monetary policy link by using the interest rate channel for Pakistan. They employed ordinary least squares as estimation technique and quarterly data covering the period 1981 to 2010. The study showed that interest rate channel of monetary policy transmission mechanism dampens output and hence financial innovation has implications for output and monetary policy. Angelopoulou et al. (2014) used principal component analysis to investigate the financial development and monetary policy relationship for the European Union Area for the period 2003 to 2011. They used financial condition index (FCI), interest rate, interest rate spread and credit quantity as variables for the analysis. It was revealed that financial condition index impact differs across the European Union Area after the Global financial crises.

Ma and Lin (2016) used panel quarterly data for 41 economies for the period 2005 to 2011 to carry out an analysis on the relationship between financial development and the effectiveness of monetary policy. They employed pooled least squares, fixed effect, and random effect estimation techniques for

the analysis. The results showed that the effect of monetary policy on output and inflation are significant but negatively correlated with financial development. They concluded that the effectiveness of monetary policy falls with improvement in the financial system. Effiong et al. (2017) also investigated whether financial development influences the effectiveness of monetary policy on output and inflation in Africa for the period 1990 to 2015 using a panel of 39 countries. They applied panel data techniques such as pooled least squares, fixed effects, random effects and generalized method of moments (GMM) as estimation techniques to the dataset. The results showed that there is a weak relationship between financial development and monetary policy effectiveness in Africa. The result further showed that there exists no statistical evidence of the link for output growth but there exists a negative link in the case of inflation on contemporaneous levels. Using a panel of 119 countries, Seth and Kalyanaraman (2017) investigated the effects of financial development on the transmission of monetary policy vis a vis output and bank liquidity for the period 1997 to 2014. They adopted bank deposits to GDP, stock market capitalization to GDP, and central bank assets to GDP as variables to capture financial development. The study showed that financial development positively impacts on output, and negatively affects bank liquidity. They also concluded that financial development heightens the effect of bank liquidity on output. Akinsola and Odhiambo (2017) also examined the impacts of financial development on monetary policy in Africa for the period 1980 to 2016. Using dynamic panel data analysis as an estimation technique, and liquid liabilities to GDP ratio and domestic credit to private sector to GDP ratio as measures of financial sector development, the study found that there exists a positive correlation between financial deepening and monetary policy. However, banking crisis dummy which was used to capture financial crises was found to be negative and significant.

A handful of researchers have attempted to investigate the subject matter in Ghana. For instance,

Abradu-Otoo, Amoah, and Bawumia (2003) conducted an investigation into the monetary transmission mechanism in Ghana. The study adopted a structural vector error correction (S-VEC) analysis for the periods of 1969:4 to 2002:4 and M2+ money supply as a shock variable. They found evidence of the monetary policy instruments having effects on inflation and output in the long run. The study also showed that the exchange rate channel remains the main medium through which monetary policy acts in Ghana. Acheampong (2005) adopted the error correction model (ECM) to investigate the interest rate channel of monetary policy transmission. The study specifically analyzed the impact and long-run adjustments of lending rate and deposit rate to changes in the money market rate. The study employed monthly data covering the period 1994 to 2004 and found that interest rates in Ghana responds sluggishly to changes in money market rates. It further noted that policy shift has some impacts on lending rate decisions of banks but no significant effect on borrowing rate.

Quartey and Prah (2008) investigated the finance-growth causal link in Ghana. They found support for the notion that growth of the economy drives enhancement in the financial sector. The study used growth of broad money as a percentage of GDP as a measure of financial development. On the contrary, the authors found no support for the finance driving economic performance.

Kovanen (2011) analyzed the interest rate pass through of monetary policy transmission using data spanning the period 2005 to 2010. The study employed interbank interest rate, prime rate, wholesale market interest rate, Treasury bill rate, retail deposit interest rates and lending rates for the analysis. The results from the vector Autoregressive model (VAR) showed that there is a relatively strong short-term response from changes in the prime rate to the wholesale market interest rates (interbank and Treasury bill). The long-term responses in the wholesale interbank market interest rate are protracted, weakening the effectiveness of Bank of Ghana's monetary policy implementation. Significant deviations from the policy rate suggest that the prime rate may not always provide an accurate indication of the monetary authorities' policy stance. This has implications for monetary policy effectiveness and central bank's ability to communicate its policies to the public. Again, Adu et al. (2013) assessed the connection between financial sector improvement and growth of the economy from 1961 to 2010. The

study used eight indices of financial development and applied the ARDL approach as the estimation technique. The authors indicated that the effect of financial development on economic growth depends on the measure of the financial development. For instance, while credit to private sector (% GDP) showed a significant positive impact on growth, broad money (% GDP) indicated a significant negative effect on growth. Fiador (2016) analyzed the link between monetary policy and financial development for three Anglophone West African countries, namely, Ghana, Gambia and Nigeria for the period 1975 to 2011. The author adopted autoregressive distributed lag (ARDL) approach for the analysis. The study revealed that monetary policy transmission in the countries investigated was ineffective. The result showed that there exists significant differences in interest rates pass-through of the three countries. Ghana and Gambia on one hand showed evidence of undershooting of lending rates to monetary policy changes but Nigeria exhibited overshooting of lending rates.

Lastly, Ofori-Abebrese et al. (2017) examined the finance-growth nexus using ARDL approach and Granger causality test. The study specifically investigated the relationship and the causal direction between financial development and economic growth in Ghana for the period 1970–2013. The study revealed that the amount of credit from domestic sources to the private sector maintained a positively significant link with the growth of the Ghanaian economy whereas domestic deposit was not the case. Also, the results established that there exists a unidirectional causality that runs from economic growth to the domestic deposit.

A synthesis of the empirical literature reviewed revealed that studies done in the field are mostly centered on the interest rate channel of monetary policy transmission (see, for instance, Abradu-Otoo et al., 2003; Acheampong, 2005; Kovanen, 2011). However, this study seeks not only to extend the study period from 1980 to 2016 but also takes into account the joint effect of financial development and monetary policy on output in Ghana using the autoregressive distributed lag (ARDL) approach.

4. Econometric methodology

4.1. Model specification

Following Fiador (2016), Ofori-Abebrese et al. (2017), Effiong et al. (2017), and Seth and Kalyanaraman (2017), a growth equation for Ghana was specified as:

$$lnY_t = \beta_0 + \beta_1 lnFD_t + \beta_2 lnMP_t + \beta_3 lnFDMP_t + \beta_4 lnFDI_t + \beta_5 lnRI_t + \beta_6 lnINF_t + \beta_7 lnK_t + \beta_8 l + \varepsilon_t \quad (1)$$

where *Y* denotes economic growth proxied by real GDP, *FD* represents Financial Development measured based on the Global Financial Index of the IMF which is a proxy of the Financial Depth, Access, Efficiency and Stability and it is measured as a percentage of GDP, is Monetary Policy measured by central banks' policy rate, *FDMP* denotes Financial Development and Monetary policy interaction. It measures the joint effects on output. It captures the extra effect of financial development while controlling for other variables. Specifically, a positive coefficient for the interaction term would suggest that financial development moderates the effect of monetary policy on output. *FDI* represents Foreign Direct Investment measured by annual foreign capital net inflows, *RI* represent Private remittances, *INF* connotes Inflation, *K* represents capital measured by gross fixed capital formation and denotes labour proxied by population (ages 15–64).

Table 1 shows the various variables used for the study, their a priori expectation and the sources of data. The choice of these variables is influenced by theoretical and empirical literature. The study employed annual time series data covering the period 1980 to 2016.

5. Estimation techniques

To analyze the long-run relationships and the dynamic interactions among the variables of interest, the autoregressive distributed lag cointegration procedure developed by Pesaran et al. (2001) was

used. The ARDL is preferred because if a model includes a mixture of and $I(1)$ variables, the most appropriate econometric method to employ is the Bound test procedure. It is also comparatively more robust and relatively more efficient in small sample data sizes as is the case in this study (Mah, 2000). In addition, the ARDL model applies general-to-specific modeling framework by taking sufficient number of lags to capture the data generating process. It estimates $(\rho+1)^k$number of regressions in order to obtain an optimal lag length for each variable, where p is the maximum lag to be used, and k is the number of variables in the equation. The model was selected on the basis of Schwarz Bayesian Criterion (SBC). The choice of the Schwarz Bayesian Criterion is based on the fact that it asserted to provide more parsimonious results and also suitable for smaller sample size as it is the case in the present study (see: Pesaran & Pesaran, 2010).

Once cointegration has been established from the ARDL model, the next step is to estimate the following $ARDL\left(P,q^1,q^2,q^3,q^4,q^5,q^6,q^7,q^8\right)$ model in order to obtain the long-run coefficients.

$$\begin{aligned} lnY_t &= \mu_0 + \sum_{i=0}^{\rho}\sigma_1 lnY_{t-i} + \sum_{i=0}^{q^1}\sigma_2 lnFD_{t-i} + \sum_{i=0}^{q^2}\sigma_3 lnMP_{t-i} + \sum_{i=0}^{q3}\sigma_4 lnFDMP_{t-i} \\ &+ \sum_{i=0}^{q^4}\sigma_5 lnFDI_{t-i} + \sum_{i=0}^{q^5}\sigma_6 lnRI_{t-i} + \sum_{i=0}^{q^6}\sigma_7 lnINF_{t-i} + \sum_{i=0}^{q^7}\sigma_8 lnK_{t-i} \\ &+ \sum_{i=0}^{q^8}\sigma_9 lnL_{t-i} + \varepsilon_t \end{aligned} \tag{2}$$

Equation (2) is then followed by the estimation of the short-run parameters of the variables with error correction representation of the ARDL model. By applying the error correction version of ARDL, the speed of adjustment to equilibrium is determined. When there exists long-run relationship among the variables, then the unrestricted ARDL error correction representation is estimated as:

$$\begin{aligned} \Delta lnY_t &= \theta_0 + \sum_{i=0}^{\rho}\lambda_{1i}lnY_{t-i} + \sum_{i=0}^{q^1}\lambda_{2i}\Delta lnFD_{t-i} + \sum_{i=0}^{q^2}\lambda_{3i}\Delta lnMP_{t-i} + \sum_{i=0}^{q^3}\lambda_{4i}\Delta lnFDMP_{t-i} \\ &+ \sum_{i=0}^{q^4}\lambda_{5i}\Delta lnFDI_{t-i} + \sum_{i=0}^{q^5}\lambda_{6i}\Delta lnRI_{t-i} + \sum_{i=0}^{q^6}\lambda_{7i}\Delta lnINF_{t-i} + \sum_{i=0}^{q^7}\lambda_{8i}\Delta lnK_{t-i} \\ &+ \sum_{i=0}^{q^8}\lambda_{9i}\Delta lnL_{t-i} + \tau ECT_{t-1} + \varepsilon_t \end{aligned} \tag{3}$$

where the coefficients are the short-run dynamics, while τ is the speed of adjustment to long-run equilibrium following a shock to the system and ECT_{t-1} is the error-correction term or the residuals obtained from equation (2). The residuals from the cointegration equation lagged one (1) period may be defined as:

$$\begin{aligned} ECT_t &= lnY_t - \theta_0 - \sum_{i=0}^{\rho}\lambda_{1i}\Delta lnY_{t-i} - \sum_{i=0}^{q^1}\lambda_{2i}\Delta lnFD_{t-i} - \sum_{i=0}^{q^2}\lambda_{3i}\Delta lnMP_{t-i} \\ &- \sum_{i=0}^{q^3}\lambda_{4i}\Delta lnFDMP_{t-i} - \sum_{i=0}^{q^4}\lambda_{5i}\Delta lnFDI_{t-i} - \sum_{i=0}^{q^5}\lambda_{6i}\Delta lnRI_{t-i} - \sum_{i=0}^{q^6}\lambda_{7i}\Delta lnINF_{t-i} \\ &- \sum_{i=0}^{q^7}\lambda_{8i}\Delta lnK_{t-i} - \sum_{i=0}^{q^8}\lambda_{9i}\Delta lnL_{t-i} \end{aligned} \tag{4}$$

Engel and Granger (1987) argued that when variables are cointegrated, their dynamic relationship can be specified by an error correction representation in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short-run and long-run relationships. The error correction term indicates the speed of adjustment to long-run equilibrium in the dynamic model. In order words, its magnitude shows how quick the variables

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Table 1. Data sources and expected signs

Variable	Empirics	Data Source	Expected Sign
Economic growth (Y)	Seth and Kalyanaraman (2017)	WDI	
Financial Development (FD)	Cihak et al. (2012) Svirydzenka (2016)	IMF	Positive
Monetary Policy (MP)	Mankiw (2006) Seth and Kalyanaraman (2017)	IFS	Positive
Financial Development & Monetary Policy (FDMP)	Seth and Kalyanaraman (2017)		Positive
Foreign Direct Investment (FDI)	Balasubramanyam et al. (1999), Saltz (1992)	WDI	Positive/Negative
Private Remittances (RI)	Singh et al. (2009)	WDI	Positive
Inflation (INF)	Frimpong and Oteng-Abayie (2010) Quartey (2010)	WDI	Positive/Negative
Capital (K)	Frimpong and Oteng-Abayie (2010) Hunt (2007)	WDI	Positive
Labour (L)	Abala (2014) Belloumi (2014)	WDI	Positive

converge to equilibrium when they are disturbed. It is expected to be statistically significant with a negative sign. The negative sign implies that any shock that occurs in the short-run will be corrected in the long-run. The larger the coefficient of the error correction term in absolute terms, the faster the convergence to equilibrium.

6. Empirical results and analysis

6.1. Test for stationarity

The Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests were employed to ascertain the absence or otherwise of $I(2)$ variables to extricate the result from spurious regression. The results are shown in Table 2.

From Table 2, the null hypothesis of the presence of unit root in the variables at their levels in the ADF Test can be rejected only for FD (financial development) and INF (inflation) but they all tend to be stationary at first difference. The PP test also showed that the variables are non-stationary at levels except for LNY (log of economic growth), FD (financial development) and INF (inflation). However, at first difference, all the variables are stationary. This indicates that the series is made up of a mixture of variables integrated of order zero $I(0)$ and order one $I(1)$. Hence it is appropriate to estimate the model using the ARDL bounds test.

7. Test for cointegration

The ARDL Bounds test of cointegration was employed to determine the long-run relationship between economic growth and its explanatory variables when log of real gross domestic product (Y, economic growth) was normalized (that is, considered as a dependent variable) in the ARDL-OLS regressions. The results are presented in Table 3.

From Table 3, the joint null hypothesis of lagged level variables of the coefficient being zero is rejected at 1 percent significance level when log of economic growth is used as dependent variable. The results reveal an *F*-statistic of 16.28, which exceeds the upper bound critical value of 3.77 at 1%. This implies that there exists a long-run relationship between economic growth and

Table 2. Results of unit root test: ADF and PP tests

ADF Test			PP Test	
Variable	**Constant & Trend**	**Constant & Trend**	**Constant & Trend**	**Constant & Trend**
	Levels	**1st Difference**	**Levels**	**1st Difference**
LNY	−2.7818	−3.4673***	−3.1872*	−3.1288
FD	−3.7899**	−6.1317***	−3.6444**	−14.2447***
MP	−1.9079	−6.5430***	−1.9629	−6.5107***
	−1.7297	−5.2902***	−1.8149	−5.2902***
FDI	−2.3127	−4.9725***	−2.4109	−5.0018***
RI	1.4717	−3.8365**	−2.7444	−8.9766***
INF	−6.4004***	−4.7646***	−6.3952***	−28.6219***
	−2.4896	−7.1120***	−2.3741	−18.3239***
L	−0.0856	0.9663**	−0.0517	−2.7858**

Note: ***, ** and * indicate the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% level of significance respectively.

Table 3. Results of bounds test for existence of cointegration

	90% level		**95% level**		**99% level**	
	I(0)	*I*(1)	*I*(0)	*I*(1)	*I*(0)	*I*(1)
K = 8	1.85	2.85	2.11	3.15	2.62	3.77
Dependent Variable F-Statistic 16.2851*** $F_{LY}(LY|FD, MP, FDMP, FDI, RI, INFK, L)$						

Note: Critical values were obtained from Pesaran and Pesaran (2010); *** denotes statistical significance at 1% level and K is the number of regressors.

its explanatory variables hence the null hypothesis of no cointegration among the variables is rejected. These results further indicate that there is a unique cointegration relationship among the variables when economic growth is normalized over the study period.

8. Long-Run results

Following the valid long-run relationship between the dependent and the explanatory variables, the long-run coefficients were estimated and the results are presented in Table 4.

From Table 4, the coefficient of financial development is positive and statistically significant at 5%. This means that with a one percent growth in financial development, economic growth increases by 0.362 percent. This can be argued that as the financial sector develops, it mobilizes and pools savings, produces information about investment, facilitates and encourages the inflows of foreign capital, as well as optimizes the allocation of capital to the private sector which in effect increase investment leading to rise in the rate of growth of the economy. This result confirms the works of Levine et al. (2000), Adu et al. (2013), Ofori-Abebrese et al. (2017), and Seth and Kalyanaraman (2017) who also found financial development to be growth enhancing. This is also an indicative that Ghana will gain from development of the financial sector.

Monetary policy also exerts positive and significant effect on economic growth at 1% significance level. The results suggest that, a one percent increase in monetary policy results in about 0.0168 percent increase in economic growth. This outcome coincides with the findings of Akinsola and Odhiambo

Table 4. Estimated long-run coefficients using the ARDL approach

Dependent Variable: LNY

Variable	Coefficient	Std Error	T-Statistic	Probability
FD	0.3620**	0.1243	2.9115	0.0121
MP	0.0168***	0.0053	3.1656	0.0074
FDMP	0.0173***	0.0053	3.2601	0.0062
FDI	0.0140***	0.0011	12.4007	0.0000
RI	0.0215***	0.0023	9.3628	0.0000
INF	−0.0005***	8.60E-05	−5.4876	0.0001
K	0.0036***	0.0011	3.3000	0.0057
L	0.0655***	0.0056	11.6336	0.0000
C	6.2353***	0.3241	19.2361	0.0000

Note: *** and ** denote significance level at 1% and 5% respectively.

(2017) and Seth and Kalyanaraman (2017) who report that in a financially developed system, the conduct of monetary policy is more effective in influencing output. This wields a positive signal for the country to promote a sound monetary management so as to improve monetary policy effect on economic growth.

In addition, the interaction term capturing the joint effect of financial development and monetary policy on economic growth, is positive and significant at 1%. The coefficient indicates that one percent increase in central bank's policy rate will improve economic growth by 0.0173 percent. Inferring from the net effect computation (see the appendix), financial development and monetary policy interaction significantly impacts growth with net effect coefficient of 0.0186. This implies that with a well-developed the financial sector, a one percent increase in policy rate contributes to economic growth by 0.0186 in the long run ceteris paribus. Since the interaction term is meant to capture the extra effect of financial development while controlling for other variables, the positive coefficient suggests that monetary policy has strong impact on economic growth in a financially developed economy. This means that the country will achieve more growth from monetary policy action if the financial sector is well developed and also efficient. This positive joint effect between financial development and monetary policy on economic growth is in accordance with the works of Effiong et al. (2017) and Seth and Kalyanaraman (2017) who found that financial development heightens the growth effect of monetary policy. However, it contradicts the findings of Misati et al. (2010), Mishra et al. (2012), and Ma and Lin (2016).

FDI inflows has a significant positive effect on economic growth. With a positive coefficient of 0.0140, it measures the dynamic response of output from changes in inflows of FDI. This suggests that a one percent increase in FDI inflows causes an approximate 0.0140 percent rise in economic growth in the long-run. This result is not consistent with previous studies by Saltz (1992) and Saqib et al. (2013) who argued that FDI inflows tend to be negative in the presence of trade. The result is however consistent with the result of Asafu-Adjaye (2005) and Balasubramanyam et al. (1999). It therefore follows that FDI inflows are a good source of stimulating economic growth of Ghana, hence there is the need to strengthen institutions to attract more FDI inflows to the country.

As expected, private remittances is positive and statistically significant at 1% level. This implies that with a coefficient of 0.0215, if the rate at which private remittances flow into the economy increases by one percent, economic growth will increase by approximately 0.0215 percent in the long-run. This finding is in line with the work of Singh et al. (2009). The result regarding remittances is an indicative that the country will benefit positively from funds that are channeled from abroad to households hence as more people transfer funds from foreign countries to their relatives in

Ghana it will lead to a rise in consumption spending and this will influence economic growth positively.

Furthermore, inflation has a negative coefficient of 0.0005 which implies that in the long-run a 1% increase in general price level causes an approximately 0.0005 percent fall in economic growth and this is significant at 1%. Studies by Sowa and Kwakye (1994) and Frimpong and Oteng-Abayie (2010) attest to this negative impact of inflation on economic growth. This result implies that, increases in inflation rate due to high prices of goods and services is deleterious to the growth the economy.

Capital is found to be positive as expected and statistically significant at 1%. With a coefficient of 0.0036, it implies that a one percent increase in capital results in approximately 0.0036% percent rise in economic growth. This corroborates the findings of Mankiw and Scarth (2008) who observed a significant positive relationship between capital and economic growth. This means that advancement in capital stock through various means like industrialization will improve the growth the economy of Ghana.

Finally, Labour is observed to exert a positive influence on economic growth as expected and it is statistically significant at 1%. This implies that a one percent rise in population (ages 15–64) leads to approximately 0.0655 percent rise in the growth of the economy. This agrees with the works of Abala (2014) and Oppong (2017). Intuitively, higher human resource suggests high level of productivity hence a rise in the number of economic active population will act as a catalyst in promoting economic growth and development. This will be achieved through increases in output produced from key sectors of the economy including manufacturing and industry.

9. Short-Run results

The study proceeds to estimate the short-run coefficients and the results are reported in Table 5. From Table 5, the coefficient of financial development is positive and statistically significant at 1%. Thus, growth and expansion in the financial sector serves as an indication of prosperity and may attract more investment leading to more growth. The result indicates that a one percent improvement in the financial sector yields about 0.216 percent expansion in output of the Ghanaian economy. The finding is consistent with that of the long-run period and confirms the finding by Adu et al. (2013). Consistent with the long-run results, the coefficient of the current value of monetary policy is positive and statistically significant at 1%. With a coefficient of 0.0113, a one percent rise in monetary policy increases economic growth by approximately 0.0113 percent in the short-run.

The joint effect of financial development and monetary policy maintains its positive impact on economic growth in the short-run. This means given that monetary policy works in the framework of developed financial sector, a one percent improvement in the financial sector enhances the capacity of monetary policy's impact on economic growth by 0.0125 percent (ref to appendix). This result alludes to the findings of Seth and Kalyanaraman (2017).

Also consistent with the long-run, private remittances has a positive and statistically significant impact on output at 1% significance level. This indicates that a one percent rise in the inflow of remittances to private individuals results in a 0.0047 percent increase in real GDP in the short run. Consistent with the long run results, inflation has a negative impact on economic growth in the short-run. With a negative coefficient of 0.0003, a one percent increase in general price level causes an approximately 0.0003 percent fall in economic growth. Studies by Frimpong and Oteng-Abayie (2010), and Quartey (2010) have found similar result.

Contrary to the long-run results, labour turn out to have negative but statistically significant impact on output at 1%. This result indicates that a one percent increase in labour leads to approximately 0.045 percent fall in economic growth in the short run. Capital has a positive and statistically

Table 5. Estimated short-run error correction odel using the ARDL approach

Dependent Variable: LNY

Variable	Coefficient	Std Error	T-Statistic	Probability
D(FD)	0.2161***	0.0290	7.4399	0.0000
D(FD(−1))	−0.1728***	0.0312	−5.5445	0.0001
D(MP)	0.0113***	0.0010	11.3051	0.0000
D(MP(−1)	−0.0040***	0.0010	−3.9222	0.0018
D(FDMP)	0.0114***	0.0011	10.6402	0.0000
D(FDMP(−1))	−0.0042***	0.0011	−3.9458	0.0017
D(RI)	0.0047***	0.0004	11.1527	0.0000
D(RI(−1))	−0.0071***	0.0008	−9.0242	0.0000
D(INF)	−0.0003***	8.38E-05	−3.5476	0.0036
D(K)	0.0024***	0.0003	8.5787	0.0000
D(K(−1))	0.0009***	0.0002	3.9432	0.0017
D(L)	−0.0451***	0.0151	−2.9949	0.0103
D(L(−1))	−0.0421**	0.0181	−2.3310	0.0365
CointEq(−1)	−0.6797***	0.0379	−16.6010	0.0000

$ECM = LNY - (0.3620 * FD + 0.0168 * MP - 0.0173 * FDMP + 0.0140 * FDI + 0.0215 * RI - 0.0005 * INF + 0.0036 * K + 0.0655 * L + 6.2353)$

Note: ***, and ** denote significance level at 1%, and 5% respectively.

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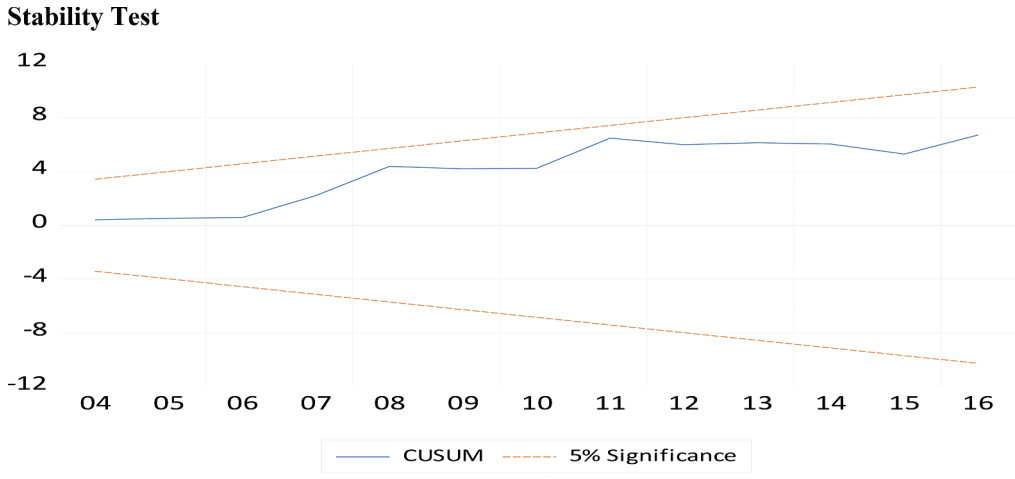

Figure 1. Plot of cumulative sum of recursive residuals.

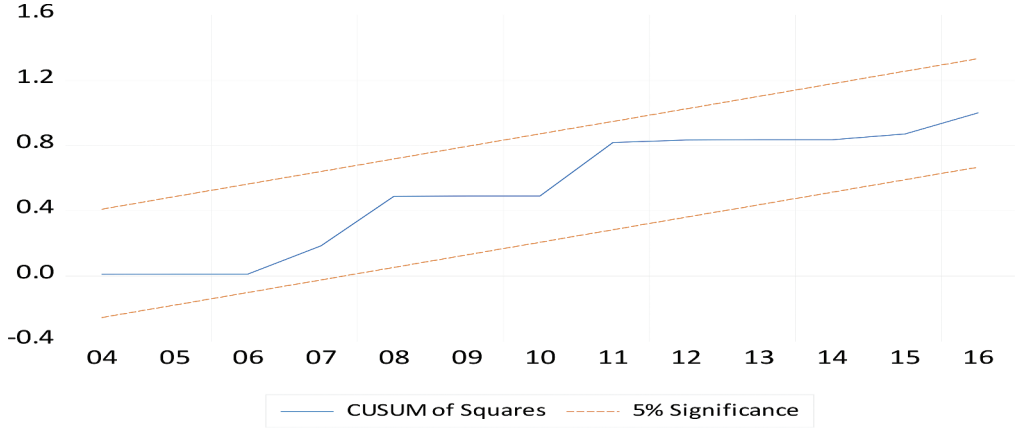

Figure 2. Plot of cumulative sum of squares of recursive residuals.

Note: The variable on the vertical axis is residuals while the variable on the horizontal axis is years.

Source: Authors' own construct using E-views 10 Package.

significant sign in the short-run and this is consistent with the long-run result. The coefficient indicates that a one percent rise in capital investment increases economic growth by 0.0024 percent.

The coefficient of the error correction term (ECM_{t-1}) exhibits the expected negative sign and it is highly significant at 1% significance level. The negative and significant coefficient further confirms the long-run cointegration established in the study. The coefficient of −0.68 indicates that a deviation from the long-run equilibrium as a result of a short-run shock is corrected at a speed of about 68% each year. Thus, any deviation (disequilibrium) in the short-run will take less than a year to be restored in the long-run.

10. Model diagnostic results

Robustness checks were employed to ascertain the estimated model doesn't suffer any post-estimation problems of serial correlation, functional form, normality, heteroskedasticity and structural stability since model misspecification may arise due to unstable parameters and hence bias of results (Hasen, 1992). Results for the model diagnostics are shown in Table A1 (see, Appendix). The results of the diagnostics test show that the estimated model satisfied the Lagrangian multiplier test of residual serial correlation among the variables (See the Appendix). This implies that, there is no evidence of autocorrelation and hence the null hypothesis of no serial correlation

among the variables cannot be rejected. Also, the estimated model passes the test for Functional Forms Misspecification using the square of the fitted values. Likewise, the model satisfied the Normality test based on the skewness and kurtosis of the residuals. Thus, the residuals are normally distributed across observation. Finally, estimated model passes the test for heteroscedasticity based on the regression of squared residuals on squared fitted values.

Lastly, from the diagnostics test in Table A1 (See the Appendix), it can be observed that the adjusted R-squared is approximately 0.95. This suggest that about 95% of the variations in the dependent variable real GDP per capita (economic growth) is explained by the independent variables. Also, a Durbin-Watson statistic of approximately 2.57 which is higher than the R-squared value of 0.95 revealed that, the estimated results are not spurious.

11. Model stability test

Model stability test was conducted to justify the credibility of the results of the estimated model and to eliminate any bias in the result of estimated model due to unstable parameters. The cumulative sum of recursive residuals and cumulative sum of squares of recursive residuals plots are depicted in Figures 1 and 2 respectively (see the Appendix). The null hypothesis is that the coefficient vector is the same in every period and the alternative is that it is not. The cumulative sum of recursive residuals and cumulative sum of squares of recursive residuals statistics are plotted against the critical bound of 5 percent significance level. The decision rule is that if the plot of these statistics remains within the critical bound of 5 percent significance level, the null hypothesis cannot be rejected. Based on Figures 1 and 2 (see the Appendix), the plot suggests the absence of instability of the coefficient, since the plots of all coefficients fall within the critical bounds at 5 percent significance level. Thus, all the coefficients of the estimated model are stable over the entire period used for the study. In summary, the CUSUM and CUSUMSQ (see the Appendix) confirms the stability of the coefficients of economic growth and its explanatory variables in the model.

12. Conclusions and policy implications

The study applied the Autoregressive Distributed Lag (ARDL) approach to investigate whether financial development influences the effectiveness of monetary policy in enhancing economic growth of Ghana for the period 1980 to 2016. It was revealed that financial development strengthens the effects of monetary policy on economic growth in Ghana. Further, financial development, monetary policy, foreign direct investment, remittances, capital and labour supply exerted significant positive impact on economic growth in both the short-run and the long-run. This indicates that these variables are critical in enhancing sustained economic growth and development of Ghana. However, inflation proved to be detrimental to economic growth in both the long-run and short-run. The study recommends that Bank of Ghana should further deepen the development of the financial sector and strengthen the competitiveness of financial markets in order to improve on the capacity of monetary policy in enhancing growth of the economy. Considering the dual objective of Bank of Ghana, monetary policy should be tailored to promote real sector lending while trying to achieve low and stable inflation. The Bank of Ghana should deepen the financial sector by reducing information and transactional cost of doing business. Policies such as improving institutional infrastructure for promoting access to credit for investment at moderate cost should be the focus. This could be achieved through facilitating the establishment of financial institutions to increase credit delivery to the private sector especially in rural areas.

The study highlights the following limitations and direction for future research. Due to data constraint as well as longer data span on some key variables like monetary policy rate (from the bank of Ghana database) and labour force (from the World Bank Development Indicators), this study used the central bank's policy rate data from the International Financial Statistics (IFS) database (which had data up to 2016) and proportion of the total population aged between fifteen (15) and sixty-four (64) years as proxies for monetary policy and labour force respectively. However, this does not undermine the results of this study. With regard to direction for future

research, we suggest that future research could looked at the specific or individual effect of the financial development components. Future research could also look at the effect of political tension by including a polity or political variables in the analysis. Last but not least, future studies could also consider the symmetric and asymmetry effect of the monetary policy and financial development on economic growth.

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Appendix
Net Effect Calculations

Table A1 Model diagnostics and goodness of fit

R-Squared	0.9501	R-Bar-Squared	0.9229
S.E. of Regression	0.0052	F-stat. F (8, 35) 16.2851	[0.0000]
Mean of Dependent Variable	10.272	S.D. of Dependent Variable	0.2281
Residual Sum of Squares	0.0004	Equation Log-likelihood	151.59
Akaike Info. Criterion	−7.4051	Schwarz Bayesian Criterion	−6.4274
DW-statistic	2.5744		
Diagnostics	Test Statistics		
$X^2_{Auto}(2)$	1.5146 [0.2624]		
$X^2_{Reset}(1)$	2.2335 [0.1609]		
$X^2_{Norm}(1)$	0.2773 [0.8705]		
$X^2_{White}(21)$	0.8713 [0.6228]		

Note: X^2_{Auto}, X^2_{Reset}, X^2_{Norm}, and X^2_{White} are Lagrange multiplier statistics for test of serial correlation, functional form misspecification, non-normal errors and with degree of freedom in parentheses (). Value in parentheses [] are probability values.

Source: Authors' own construct using E-views 10 Package.

Long-run net effect

$$LN(Y) = 0.3620(FD) + 0.0168(MP) + 0.0173(FDMP)$$

$$\frac{dGDPG}{dMP} = 0.0168 + 0.0173(FD)$$

$$= 0.0168 + 0.0173(0.102)$$

$$= 0.0168 + 0.0018$$

$$= 0.0186$$

$$= 1.86\%$$

Testing for the significance of the interaction

$$H_0 : FDMP = 0$$

$$Prob.>F = 0.0129 ***$$

Short-run net effect

$$LN(Y) = 0.2161(FD) + 0.0113(MP) + 0.0114(FDMP)$$

$$\frac{dGDPG}{dMP} = 0.0113 + 0.0114(FD)$$

$$= 0.0113 + 0.0114(0.102)$$

$$= 0.0113 + 0.0012$$

$$= 0.0125$$

$$= 1.25\%$$

For$FDMP_{t-1}$

$$LN(Y) = 0.2161(FD) + 0.0113(MP) + (-0.0042(FDMP))$$

$$\frac{dGDPG}{dMP} = 0.0113 - 0.0042(FD)$$

$$= 0.0113 - 0.0042(0.102)$$

$$= 0.0113 - 0.0004284$$

$$= 0.0109$$

$$= 1.09\%$$

Source: Authors' estimation using E-views 10 and Stata 14.

Model Diagnostics and Goodness of Fit

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