The Interplay of Demand for Foreign Currencies and Exchange Rate Dynamics in Ghana

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ABSTRACT

The increasing trend in which Ghanaians hold deposits and loans denominated in foreign currency – notably the U.S. dollar – has generated a lot of controversy in macroeconomic discourse recently. Although the debate has usually been linked to exchange rate volatility and inflation in developing countries practising floating exchange rates, empirical evidence in Africa is still limited. The purpose of this study is to explore the interplay between dollarization, inflation, and exchange rates for the period January 1990 to March 2016. The methodology employed consisted of the Johansen co-integration and vector error correction framework that capture both the short run and long run dynamics of the interplays between the variables. Monthly data for the consumer price index, broad money, and nominal exchange rates were obtained from the International Monetary Fund’s International Financial Statistics (IMF IFS) 2016 online database. The rest of the data; foreign currency deposits and total deposits were also obtained from the Research Department of the Bank of Ghana. After confirming the degree of integration of the variables, the Johansen co-integration approach was implemented to determine whether the variables share any long-run relationships. The finding is that the variables were co-integrated, suggesting a common trend or co-movement of the variables in the long-run. Further, it was reported that there is a positive effect of exchange rate and inflation on dollarization in the long-run. This co-movement brings to bear the predictability of some of the variables using the behaviour of the other variables. The findings highlight that, the ability of the Bank of Ghana to control the high demand for foreign currency depends on its capability of controlling abnormal rates of exchange rate depreciation and high inflation. Also, since persistent depreciation is such as to present deleterious inflation it suggests that the major task for the monetary authority is to control exchange rates.

Keywords: Dollarization, exchange rate, foreign currency, inflation

1.0 INTRODUCTION

It has been argued that dollarization is the main cause of instability in flexible exchange rates and has been a significant destabilizing force in the world economy (Catao & Terrones, 2005; Davidson & MacKinnon, 1993; Willett & Banaian, 1996). It has been argued that, the extent to which dollarization impacts on macroeconomic fundamentals such as inflation and exchange rates can depend on the form of dollarization that exists in a given economy, especially when comparing full dollarization and partial dollarization. A major challenge in Ghana since the adoption of a flexible exchange rate regime in 1986 has been the persistent depreciation of the Ghanaian Cedi against most of the major international currencies. Although, the issue has become widespread in sub-Saharan Africa to the extent that Zimbabwe has officially substituted its currency. Over the first nine months of 2014, the inter-bank exchange rate market recorded a depreciation of
31.19 per cent against the U.S. dollar, compared to a depreciation of 4.12 per cent recorded during the corresponding period in 2013 as cited by (Terker, 2014). Full dollarization minimizes the volatility of exchange rates particularly in Latin American countries (Bogetic, 2000; Lange & Sauer, 2005). According to (Mckinnon & Pill, 1996), the concept of international dollarization is useful for explaining why floating exchange rates have been so volatile. However, evidence based on partially dollarized countries by (Akçay, Alper, & Karasulu, 1997; Mengesha & Holmes, 2013b; M. A. Yinusa & Basil, 2008) suggest that an increase in dollarization increases exchange rate volatility. Major fluctuations associated with exchange rates still be a concern for academics, financial analysts, and policy makers due to its importance for macroeconomic management. According to (Terker, 2014), the Ghana cedi also depreciated by 29.32 per cent and 23.63 per cent against the pound sterling and the Euro, respectively in the same period, and that compared with 16.73 per cent and 20.05 per cent depreciations respectively, against those currencies at the end of 2013, with higher depreciation in the black market. Whether the increasing trend of dollarization in transition economies is due to institutional reforms, financial development and/or weakened macroeconomic fundamentals have remained an elusive empirical quest. In addition, exchange rate dynamics play an important role in international trade and the degree of external sector competitiveness of the economy. Such developments in the foreign exchange market hold implications for the welfare of households, firms’ profitability, price stability, and the susceptibility of the overall economy (Georgiadi, 2014; Towbin & Weber, 2013) For monetary zones such as the Euro area that are fully dollarized, there is evidence of a decline in exchange rate volatility by (Bartram & Karolyi, 2006; Chit, Rizov, & Willenbockel, 2010; Clark, Tamirisa, Wei, Sadikov, & Zeng, 2004; Matthew & Adegbuyi, 2014; Schnabl, 2008, 2009). If import demand and export supply elasticity are sufficiently low, then this effect is such as to dominate the demand and switching effect that currency depreciation is expected to cause in order to restore equilibrium in the trade position (Bahmani-Oskooee & Hegerty, 2007; Carlberg, 2012).

The debate on the relationship between dollarization and exchange rate volatility has not settled due in part to the differing evidence which has usually been based on the structure of an economy, the type of exchange rate regime, its monetary policy, and the extent of dollarization in that economy. It is an important research endeavour since broadening our understanding of the relationship between dollarization and exchange rate fluctuations would be very useful for monetary and fiscal policymaking, academic research, risk management practices, and investment analysis. One of the arguments put forward by the Bank of Ghana for the implementation of the foreign exchange restrictions was the suspicion that the rising trend of dollarization in the economy was the cause of the fall of the Ghanaian cedi. There are certainly some theoretical underpinnings and empirical evidence in the literature that dollarization leads to exchange rate volatility. The subject is supposed to be more engendering considering the extent of openness, the rising trend of foreign currency demand, and the rate at which exchange rate instability has strangled most productive sectors of import dependent economies in the continent. This study seeks to fill important gaps in the existing literature, by providing answers to some questions that enable us to draw implications and options for macroeconomic policymaking against the backdrop of rising dollarization.

Although, the issue of dollarization has usually been linked to exchange rate volatility and inflation in developing countries practising floating exchange rates. The consequence of this situation is that macroeconomic policy making in Ghana and the African continent as a whole has not benefited significantly from scientific knowledge on the evolution and the costs associated with dollarization. The challenges associated with this are largely, if not wholly, attributable to the imperfect knowledge of policy makers or their inadequate understanding of the behaviour of some parameters driving the pillars of macroeconomic instability in Ghana. The non-existence of empirical research on the Ghanaian economy has left significant gaps in the empirical and theoretical literature that merits the attention of academia and policymakers. The issue of reliance on foreign currencies has become widespread in emerging economies in the past few decades due to the extensive switch to floating exchange rates and the subsequent removal of capital controls which came with the economic liberalization adopted in the early 1980s. Given the wide range of issues on the roots, the risks and the costs associated with dollarization, this proposed study is narrowed to focus on the interplay between dollarization, prices, and exchange rates in Ghana. It investigates whether prices and exchange rates play a role in the evolution of dollarization and also consider how the rising demand for foreign currencies in Ghana affects macroeconomic fundamentals. Attaining this greater understanding of the dynamic interrelationships between dollarization
and macroeconomic variables in Ghana is very crucial to the sustainable growth and development of developing economies. The study seeks to unzip knowledge on imperative aspects of dollarization that have dodged macroeconomic policy and debate in Ghana for so many years.

2.0 LITERATURE REVIEW
The two terminologies, currency substitution and dollarization, have been used for different meanings or sometimes interchangeably depending on what function of money the foreign currency performs in the domestic economy. According to the argument of (Feige, 2003; Sahay & Vegh, 1995), currency substitution relates to use foreign currency as a medium of payment, whereas asset substitution or financial dollarization has the foreign denomination performing the function of storing wealth. Since deposit dollarization captures only one side of the balance sheet, liability dollarization has also been used in the literature as foreign currency loans (FCLs) issued by the domestic banking sector either to domestic firms and households or to foreign institutions.

When the preference for foreign currency has been to function as a store of value, economic agents do so with the intent to preserve their wealth as the domestic currency persistently loses its economic value or worth as a result of high rates of depreciation and/or inflation which leads to erosion of purchasing power of the local currency against other trading currency (Calvo & Végh, 1996). As already defined by (De Nicoló, Honohan, & Ize, 2005), payments dollarization and currency substitution refers to foreign currency performing as a medium of transaction or exchange. On the other hand, Mueller (1994) suggests a contrasting definition in which currency substitution and dollarization describe the case where demand for foreign money is reversible and non-reversible, respectively. (Calvo & Végh, 1996) slightly distinguish between the terminologies by describing currency substitution as transfer of transaction function of local currency, whereas dollarization is described as the transfer of the other functions of money. Quite clearly, dollarization is a process and as to whether an economy is described as partially dollarized or fully dollarized also depends on the function of money in a foreign currency provides in the economy.

According to them, the use of foreign currency to index prices, wages, and real contracts in the economy is real dollarization. This stage where the preference for holding foreign currency is to serve a store-of-value function begins a process is known as partial dollarization (Ho, 2003). Official dollarization (or currency substitution) entails the authorized complete replacement of the domestic currency with foreign notes and coins. An attempt to construct a measure of dollarization requires an answer to the vital question of what role the foreign currency assumes in the economy. Theory on drivers of dollarization/currency substitution The empirical literature on financial dollarization or currency substitution has focused on different strands such as drivers/determinants, benefits/effects, and strategies to de-dollarize. Substitution refers to the potential for partial replacement of a currency and its dimension, whereas substitutability is the ability to use foreign money as a medium of transaction or at least as a unit of account. This simply indicates that, currency substitution is used when the domestic currency is fully replaced or substituted with a foreign currency to service all its functions including as a medium of transaction.

As this continues it necessitates a gradual undemanding acceptability of the foreign currency as medium for payments of goods and services usually when they are indexed to foreign currency and the domestic currency gradually loses its property of general acceptability or the medium of exchange function.

Different terminologies have been assigned in the literature to different scenarios depending on the degree of substitution by the foreign currency. Another definition of dollarization is given by (Savastano, 1996) as the substitution of the domestic currency. The authors refer to the indexation of local wages and prices in foreign denomination as real dollarization whereas transaction dollarization occurs when foreign notes and coins serve as medium of exchange or payment. Economic agents to achieve this, they hold banknotes of foreign currency; hold foreign currency accounts in domestic banks or hold foreign accounts with foreign currencies or invest in foreign bonds.

Whether the foreign currency only takes the store of value function, the unit of account function, or the means of payment function hold different implications for policymaking. (Reinhart, Rogoff, & Savastano, 2014) define a partially dollarized economy as one where households and firms hold a fraction of their portfolio in foreign currency assets and/or where the private and public sector has debts denominated in foreign currency. Financial dollarization (or asset substitution) is when domestic investors hold financial assets or liabilities in foreign denomination.
(D. O. Yinusa, 2008) argues that, as the store of value is closely linked to international capital mobility, discussions about the theory of currency substitution brings out discussions about the money demand framework in an economy where multiple currencies circulate. In general, one can argue that, dollarization and currency substitution have somewhat alternative meanings in the literature. When this situation occurs, the process is termed full dollarization or currency substitution. Currency substitution then becomes the final stage of the process of dollarization.

However, it remains a tedious task to ascertain the amount of foreign currencies circulating in the economy and foreign currency loans and deposits in offshore accounts. This makes currency substitution or full dollarization the highest stage of dollarization. In the description of (Calvo & Végh, 1996), currency substitution occurs when different currencies serve as a medium of transaction.

2.1.0 The Currency Substitution Theory

It posits that, countries characterized by those features exhibit a high opportunity cost of holding the domestic currency, thereby inducing economic agents to find confidence in foreign currencies as a store-of-value and sometimes as a medium of transaction (Baliño, Bennett, & Borensztein, 1999; Basso, Calvo-Gonzalez, & Jurgilas, 2011; Feige, 2003; Reinhart, Rogoff, & Savastano, 2003; Sahay & Végh, 1995). This view propounds a negative relationship between the demand for domestic currency and inflation, which requires a hedge against the risks associated with the erosion of purchasing power occasioned by the weakening macroeconomic fundamentals (that is, high rates of inflation and exchange rate fluctuations). As contended by (Guidotti & Rodriguez, 1992), since long period of inflation and depreciation have been cited as justification for the switch to foreign currency, then a similarly long period of currency stability is necessary to reverse the process once it occurs.

The main thrust of the currency substitution view is that, movements in prices of and/or exchange rate depreciation lead to a loss in the real value of financial assets, which increases the motivation to hold assets in foreign currency if economic agents expect any of those to occur. (Honohan, 2007), using 121 countries for the period 1993 to 2004, contends that a depreciation of the domestic currency reinforces dollarization due to agents’ expectations about the path of the exchange rate. The evidence suggests that, an increase in the real exchange rate (real appreciation) encourages liability dollarization potentially because it decreases the real cost of foreign-currency debt in terms of domestic currency, which can lead to borrowing from abroad. The results highlight the relevance of exchange rates to the currency substitution process, implying that the more volatile naira/dollar exchange rate becomes the more Nigerians switch to hold foreign currency for a store of value purposes. The results indicate that deposit dollarization significantly increases and currency mismatches are more severe in financial intermediation following the adoption of a flexible exchange rate regime. The variables used in the model included the expected change in exchange rate, domestic policy interest rate, demand for domestic money, Gross Domestic Product, the consumer price index, Federal Funds rate (proxy for foreign interest rate), and a measure of exchange rate volatility.

Based on the credit and deposit dollarization ratios, the deposit-credit mismatch ratio was also measured as the difference between foreign currency deposits and foreign currency credit divided by total bank liabilities. The results of the ECM, which was confirmed by Granger causality tests, indicate a unidirectional Granger-causal relationship from the exchange rate to dollarization in both Egypt and South Africa. Some empirical studies that find exchange rate volatility as a significant determinant of dollarization includes (Arteta, 2005; Günay & Kilınç, 2015; Kesriyeli, Özmen, & Yiğit, 2011). However, the author claims that, the response of dollarization to exchange rate changes is too trivial to warrant “fear of floating” by dollarized economies. (García-Escriibano, 2010; Naceur, Hosny, & Hadjian, 2015) finds a positive link between real exchange rate and deposit dollarization. (Rojas-Suarez, 1992) highlights that exchange rates affect the desire to hold foreign currency for Peru. (Kesriyeli et al., 2011) investigate the causes and consequences of non-financial corporate sector liability dollarization in Turkey using sector-level disaggregated annual data compiled by the Central Bank of the Republic of Turkey for the period of 1992-2003

2.1.1 The Portfolio Theory

(Ize & Yeyati, 2003) proposed the minimum variance portfolio and attributed dollarization to expectations of high uncertainties associated with inflation relative to that of the real exchange rate (De Nicoló et al., 2005). Portfolio theory assumes the validity of the uncovered interest rate parity, such that an increase in the variance of domestic inflation relative to the variance of real currency depreciation induces financial dollarization as the domestic currency becomes unattractive.
The proponents of this theory argue that, barring real interest rate differentials across currencies, investors design currency portfolios that minimize the variance of portfolio returns which depend on the volatility of inflation and the rate of real currency depreciation. Consequently, while the real return on assets denominated in local currency is influenced by variations in inflation, the actual return on foreign currency denominated assets is affected by real exchange rate fluctuations. Second, more open countries are likely to display higher rates of dollarization, suggesting that when the import component is large it feeds into higher pass-through effect of exchange rates to price dynamics.

2.1.3 Interest rate differential
Variables used in the baseline model included interest rate differential, the minimum variance portfolio dollarization share, the change in the rate of inflation, an index of asymmetry of exchange rate movements, and exchange rate intervention. (Basso et al., 2011), the interest rate differential has a negative effect on deposit dollarization while access to foreign funds increases credit dollarization but at the same time decreases deposit dollarization. They study specified an optimal portfolio allocation model and used new aggregate data for 21 economies (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, and Slovakia, Bulgaria, Romania, and Croatia) from Central and Eastern Europe and Central Asia for the period 1990 – 2003. They report a negative relationship between deposit dollarization and the difference between domestic and foreign currency interest rates in 24 transition economies over the period 2000 – 2006. Interest rate differential, loan-to-deposit ratio, openness, and severity of regulatory measures aimed at discouraging foreign currency borrowing were used as regressors.

2.1.4 The Market Failure Theory
In a study to empirically examine the determinants of credit dollarization of 21 transition economies,(Basso et al., 2011; Luca & Petrova, 2008) report that deposit dollarization and the decision of banks equate the assets and liabilities sides of their balance sheet compel the rate of credit dollarization. It claims that financial dollarization increases when agents can easily access foreign currency denominated credit facilities without regard for the risks emanating from currency depreciation. Also, whilst access to foreign fund causes credit dollarization to increase, it causes deposit dollarization to decline. A study by (Haiss & Rainer, 2012; Mengesha & Holmes, 2015) to determine the drivers of loan dollarization shows that deposit dollarization has a positive impact on loan dollarization. They concluded that, whereas relative rate of return increases credit dollarization, it lowers deposit dollarization. According to (Broda & Yeyati, 2006), this dollarization bias crop up when the probability of default correlates positively with real exchange rate and when there is imperfect information on the borrower’s currency composition. Another study by(Honohan & Shi, 2002) support that credit dollarization declines when deposit dollarization increases. On the other hand, the authors report of a positive association between deposit dollarization and offshore deposits of banks in emerging economies.

2.1.5 The Institutional Theory
Institutional theory occurs since policymakers seek to build credible exchange rates economic policy makers build their credibility with a stable exchange rate instead of regulations or strong institutional frameworks to boost the confidence in the domestic currency. Such imperfections in the institutional set up increase of financial dollarization and the costs associated with exchange rate depreciation (De Nicoló et al., 2005; Obstfeld, 2013; Reinhart et al., 2014).

2.1.6 Effects of Dollarization on Exchange Rate
The theory of how dollarization affects exchange rate volatility hinges on demand and supply of currencies. This is the reason why the volatility of exchange rates in countries that fix their currencies against a hard (or a more stable or stronger) currency such as the U.S. dollar is minimal. The theoretical underpinning of this is that, part dollarization points out the presence of asset and/or currency substitution in the economy, which suggests that economic agents can swap foreign and domestic currencies to suit their portfolio needs. It has been argued that partial dollarization aggravates exchange rate volatility, whereas full dollarization results in stability of exchange rates. This theory posits the probability of swings in the value of the exchange rate depending on the market dynamics – demand and supply.

2.2 Partial dollarization and exchange rate volatility
Applying the Granger causality test within a Vector Autoregressive model,(D. O. Yinusa, 2008) explores the link between dollarization and nominal exchange rate volatility in Nigeria for the period 1986 – 2003.With official and black market exchange rate data, the exponential GARCH model supports that a positive relationship exists between dollarization and real exchange rate volatility. Besides this theory, (Civcir, 2005) provide proof that exchange rate instability in Turkey increases with an increasing degree of currency substitution using an exponential GARCH modelling approach. Their findings indicate that dollarization causes exchange rate depreciation in instability of the Cambodian currency. Another
study by (Mengesha & Holmes, 2013b) uses Eritrean quarterly data for the period 1996 – 2008 to scrutinize the importance of dollarization in exchange rate fluctuations or instability in the economy. The author argues that strategies aimed at averting exchange rate volatility in the Nigerian economy must incorporate measures to address the issue of rising dollarization. Data employed included nominal exchange rate of the riel against the US dollar, broad money (M2), foreign exchange reserve, consumer price index, interest rate (deposit deposit), and foreign currency deposits. According to the results, there is a bi-directional causal relationship between dollarization and exchange rate volatility, although the causality running from dollarization to exchange rate volatility seems stronger. In a currency substitution model developed by (Girton & Roper, 1981), money demand functions were used to prove the effect of currency substitution on exchange rate instability.

A number of studies have reported that partial dollarization causes an increase in exchange rate volatility. (Civcir, 2005) also developed a theoretical model on how currency substitution or dollarization increases the instability of exchange rates. They concluded that; currency substitution increases the change in the exchange rate required to restore equilibrium when there are deviations from the steady state. The theory built by (Corrado, 2008) also suggests that financial dollarization causes higher exchange rate movements. The connection between dollarization and exchange rate volatility has remained unresolved both theoretically and empirically. According to the authors, there is a positive correlation between the degree of currency substitution and to variations in the exchange rate. The higher the degree of partial dollarization, the more volatile the exchange rate becomes. The authors applied Granger causality tests with the GARCH approach and incorporated foreign exchange reserves and interest rate differentials.

2.3 Full Dollarization and Exchange Rate Stability

Although the generally purported view is that partial dollarization causes exchange rate volatility, full dollarization, or currency substitution is expected to lead to lower risk premium, as it alleviates the depreciation of the domestic currency against the anchor currency. Also, the lower currency risk (risk premium) enhances the competitiveness of the dollarized countries, leads to improved access to the international capital markets and enhanced financial sector stability, lower risk of capital controls, and lower information costs (Borensztein & Berg, 2000). As per (Bogetic, 2000; Mengesha, 2013; Mengesha & Holmes, 2013a), among others, consider the impact of full dollarization and report that the volatility of exchange rates in Latin American countries has been lowered. Moreover, since currency stability is a necessity for financial development, dollarization is expected to boost the development of a country’s financial sector and lead to strong economic growth (Aghion, Bacchetta, Ranciere, & Rogoff, 2009; Borensztein & Berg, 2000). According to (Fielding & Shields, 2005), full monetary union brings lower real exchange rate volatility than under a fixed exchange rate system.

2.4 Partial, Full Dollarization and Inflation

A high degree of liability dollarization in an economy is associated with a higher exchange rate pass-through due to the balance sheet effect of currency depreciation. The findings of the study point out that, inflation increases owing to an upsurge in dollarization in both the short-run and long-run dynamics notwithstanding whether official or black market exchange rate is employed in the analysis. Precisely, the pass-through effect of the exchange rate on prices was higher in economies with a high degree of dollarization than in countries with less dollarization. The bottom line is that, if a larger amount of debt is denominated in foreign currency; the effect of the exchange rate depreciation on the firms’ balance sheet becomes bigger. (Borensztein & Berg, 2000) based on panel estimation techniques to claim that the average inflation rate is consistently higher and more variable in economies with a high degree of dollarization than in economies with low to moderate degrees of dollarization. (Reinhart et al., 2014) used panel regressions in 90 countries covering the period 1996 – 2001 to provide evidence that the inflationary impact of exchange rate variations differs across highly dollarized and less dollarized economies. In a related literature, the effect of dollarization on exchange rate pass-through has also been considered. For example, (Devereux & Yetman, 2010) employs vector autoregression and co-integration models and find that the exchange rate pass-through effect is low in a highly dollarized economy, Croatia.(Bahmani-Oskooee & Domac, 2003; Tweneboah, 2016) used a generalized impulse response functions in a vector autoregression model to test the importance of dollarization in the evolution of inflation for the Turkish economy. When firms issue bonds in foreign currency, exchange rate depreciation affects the firm’s balance sheet due to the mismatch of cash.
flow. In a recent study by (Mengesha & Holmes, 2015) for Eritrea, inflation is modelled under partial dollarization within a vector error correction model (VECM) framework and dynamic ordinary least squares (DOLS) for the period 1996 to 2008. This strand of the literature claims that exchange rates pass-through increases in the rising degree of dollarization. Whereas (Ghalayini, 2011; Ize & Parrado, 2006; Karacal, 2004; Reinhart et al., 2014), and others support that high dollarization is associated with high rates of inflation, studies by (Borensztein & Berg, 2000). Contrary to the above evidence, other studies report that the exchange rate pass-through is less in dollarized countries. The results of the study indicate that, dollarization increases inflation despite the initial drop in monetary base in response to dollarization shock.

Sub-Saharan Africa: Burundi, Cameroon, Central African Republic, Congo DR, Cote D’Ivoire, Gabon, Gambia, Ghana, Lesotho, Malawi, Nigeria, Sierra Leone, South Africa, Togo, and Uganda), (Mengesha, 2013) covers the period 1980 – 2005 and indicates that countries that have officially adopted other currencies exhibit lower average inflation rate than unofficially dollarized countries. The evidence provides support for a lower inflation rate in the franc zone area as against sub-Saharan countries that are not members of the franc zone. (Edwards & Magendzo, 2001) use a matching estimator approach and find that inflation is significantly lower in highly dollarized countries than less-dollarized economies. It has been argued by (Alesina & Barro, 2001) that, approving another country’s currency “eliminates the inflation-bias challenge associated with discretionary monetary policy.” Under full dollarization, banks lend foreign currencies and expect to receive payments in the foreign currency. Another study on Ecuador by (Soto, 2009) uses quarterly data for 1/1991 – 4/2006 and documents that the rate of inflation declines under full dollarization. The effect of full dollarization on inflation is reaching a consensus which is anchored on the widely held view among economists and policymakers that full dollarization eliminates (or at best reduces) the mismatch effect in the balance sheet of firms. Under such circumstances, exchange rate pass-through effect is avoided in fully dollarized economies unlike in partially dollarized economies (Mengesha & Holmes, 2015) employs a modified control group approach and the probit model to examine the economic performance of the CFA franc zone versus non-CFA countries in recent years.

2.5 Other costs associated with Dollarization

Attempts to curb this problem in some countries have resulted in foreign exchange regulations that require that the foreign currency credit should be used to pre-finance exports, it is in this light that, (Hoyt Bleakley, 2005) provide evidence that firms that produce taxable goods in Latin American countries seem inclined to liability dollarization than non-tradable firms. When the high rate of depreciation of the domestic currency causes the cost of servicing foreign-currency denominated debts, it increases the probability of default and weakens the financial position of banks. Without appropriate hedging mechanisms, this problem with a currency mismatch could possibly be eradicated by boosting banks access to foreign-currency to be in a position to extend credit facilities to firms with a stream of income denominated in foreign-currency. This occurs when the economy becomes highly prone to exchange rate volatility risks, which negatively affects the financial position of local firms that have outstanding loans denominated in foreign currencies. Requiring banks to lend their dollar deposits to credit worthy foreign banks, as in the case of Croatia, is also effective in helping banks minimize the currency mismatch, currency risk and credit risk. The authors employed, as a proxy for financial dollarization, the share of the sum of dollar deposits and foreign liabilities in the domestic banking sector in the Gross Domestic Product. (Angkinand & Willett, 2011; Domaç & Peria, 2003) find that ratio of foreign liabilities to assets of local banks is positively correlated with the probability of facing a systemic banking crisis.

2.6 Loss of Seigniorage

In a study to examine the seigniorage costs of official dollarization in 15 Latin American countries, (Sauer et al., 2005) decomposed the total costs into seigniorage transferred to the foreign country that issues the currency and the lost due to greater financial stability in the dollarized country. According to (Bogetić, 2000), the estimated seigniorage loss for Latin American countries in the period from 1991 – 1997 ranges from 0.5 percent of GDP for Argentina to about 7.5 percent of GDP in Ecuador. (Chang, Yu, & Vetterli, 2000) further argues that purely considering computed seigniorage loss can only be unambiguously interpreted as “real losses” to the economy if policy credibility is guaranteed. Contrary to the evidence that high degree of dollarization is associated with high seigniorage loss, (Reinhart et al., 2014) report that the profits accruing to the monetary authority from issuing currency and degree of dollarization among East African Community countries during the period 2000 – 2008 was generally independent. Likewise,
(Humpage, 2002) estimated seigniorage loss for the period 1990 – 2000 ranges from 0.1 percent of GDP in Ecuador to about 5.5 percent of GDP in Chile.

2.6.1 Loss of Lender of Last resort functions of the Central Bank

Aside the role of central banks in providing short-term liquidity to solvent banks facing liquidity problems, they are also the ultimate guarantee to maintain the stability of the monetary and payments systems in the event of a systemic bank run. However, the capacity of a central bank in an economy characterized by high deposit dollarization may be impugned or impaired to bailout domestic banks in case of distress or of bank runs (Borensztein & Berg, 2000)

2.6.2 Effectiveness of monetary Policy

one key finding in the dollarization literature hypothesize that since dollarization reduces the costs associated with switching to the use of foreign currency it causes an increase in the volatility of money demand, which impinges on the central bank’s capacity to conducting monetary policy. Since international reserves are the only cushion to curb bank runs for foreign currency deposits, the incidence of high rates of deposit dollarization also impinges a colossal limitation on monetary policy management. Also, the fact that high dollarization reduces the capacity of central banks to stem a liquidity crisis by playing the role of lender of last resort, exposes the financial system to liquidity and solvency risks (Mengesha & Holmes, 2015).

(Alvarez-Plata & García-Herrero, 2008) argue that, if the choice of an intermediate target is dependent on its effect on the price level through transaction demand for money, then including foreign currency in circulation in the targeted monetary aggregate is appropriate. The inability of the central bank to control liquidity could fuel consumer price inflation, particularly as monetary policy instruments affect only a portion of domestic currency holdings. This suggests that monetary policy is only hampered when there is currency substitution – where the function of foreign currency is invoked as a medium of exchange in the domestic economy.

The paucity of literature on sub-Saharan African countries like Ghana and the continent in general makes it difficult to establish the exact nature of the relationships that exist between dollarization, exchange rates, and prices. It is also clear from the review that many of the studies that have been conducted have had a bias towards the relatively more prosperous Latin American and East Asian countries. To conclude, the literature survey indicates that some relationship exists between the exchange rate and some economic variables.

3.0 Methodology and Empirical Evidence

Different econometric models was applied to monthly data in Ghana including a measure of dollarization, consumer price index, and a nominal exchange rate, covering the period 1/2000 – 3/2015. Monthly data for the consumer price index, broad money, and nominal exchange rates were available from the International Monetary Fund’s International Financial Statistics (IMF IFS) 2015 online database covering the period 1/2000 – 3/2015. The rest of the data; foreign currency deposits and total deposits were obtained from the Research Department of the Bank of Ghana. Since the co-integration technique required the use of levels series, the consumer price index was used instead of the inflation rate which represents the difference form.

Some methods used to determine a relationship between the variables are simple regression (Ordinary Least Squares), co-integration, and Vector Autoregression (VAR) based Error Correction Model (ECM) for both short run and long-run periods. Preliminary tests include unit root tests, lag order selection and co-integration tests.

A number of techniques such as the ADF test (Dickey & Fuller, 1979, 1981), the PP (Phillips, 1987, 1988; Phillips & Perron, 1988), the KPSS test (Phillips & Jin, 2002), the ERS Point Optimal (ERS, 1996), and the (Perron & Qu, 2007) have been proposed for unit root tests. A series that contains a unit root is said to be integrated of order d, such that it needs to be differenced d number of times before it becomes stationary. A key step in the estimation technique is the unit root test which determines whether a series contains a stochastic trend and provide the order of integration. A time series data that needs to be differenced once in order to become stationary, is said to be integrated of order 1, denoted I(1). In this study, the ADF, PP, and KPSS tests would be employed.

By the co-integration and Error Correction Model, if two non-stationary variables and are co-integrated, then there must exist an error correction representation which describes the short-run dynamics. If such a stationary linear combination exists, the non-stationary time series is regarded as co-integrated. The stationary linear combination is called the co-integrating equation and may be read as a long-run equilibrium relationship among the variables. The theory of non-stationary time series
analysis was given by (Engle & Granger, 1987) through the Granger Representation Theorem. Following the methodology proposed by (Johansen, 1991, 1995) and (Johansen & Jondeau, 1995), we can formulate an error correction model as follows:

\[ \Delta X_t = \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \ldots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \varepsilon_t \]

Where \( \Delta \) - first difference operator, \( \Pi \) is a \( n \times n \) matrix defined as \( \Pi = -I + \Pi_1 + \Pi_2 + \ldots + \Pi_k \), where \( I \) is an identity matrix and \( \Gamma_i = -I + \Pi_1 + \Pi_2 + \ldots + \Pi_i \), for \( i = 1, 2, \ldots, k \), \( I \) is an independent and identically distributed n-dimensional vector with mean zero and variance equal to matrix \( \sum \varepsilon \). Again, this equation can be rewritten as

\[ \Delta X_t = \mu + \sum_{j=1}^{k-1} \Gamma_j \Delta X_{t-j} + \Pi X_{t-k} + \varepsilon_t \]  

Where \( \Pi = \sum_{j=1}^{k} A_j - I \) and \( \Gamma_i = \sum_{j=i}^{k} A_j \).

Both the trace and maximum eigenvalue tests to determine the number of co-integrating vectors between the variables by testing the null hypothesis that there is no co-integration () against the alternative hypothesis that there is co-integration () for the trace test and for the maximum eigenvalue test. The model estimates the significance of the error term in the co-integrating vector(s) to look at how quickly the series adjust to deviations from the long-run equilibrium condition. The dynamic interactions of non-stationary but co-integrated series are usually specified by ECM which places reduced rank restrictions on the matrix of long-run impacts from a VAR model. Evidence of at least one co-integrating vector () between the variables, various ECM will be determined and specified and the long-run relationships analysed. If rank = 0, the matrix is said to be null, implying no co-integration and equations in vector become a common VAR in first differences.

### 3.1 VAR/VEC Accounting Innovations

While impulse response functions trace the effects of a shock to one endogenous variable on the other variables in the system, variance decomposition separates the movements in the dollarization process into component shocks to the other variables. To be able to ascertain the response of the dollarization variable to shocks in the other variables and the contribution of the variables in the movement of dollarization, impulse response functions and variance decomposition are employed within a VAR and VEC models.

### 4.0 RESULTS AND DISCUSSIONS

The plots of the variables in levels as well as their first differences are shown in figure 1 and Figure 2 respectively. As can be seen from the plots, all the variables have exhibited trend terms in their levels over the period. The main differences of variables have shown some variability around the mean depicting the possibility of a stationary behavior.
4.1 Summary Statistics

The descriptive statistics shown in Table 1 indicate that, with the exception of the exchange rate, the results for the levels also indicate that all the variables are negatively skewed and platykurtic with dollarization being more negative (-2.322). As for the first differences, all the variables have a positive skewness and are characterised by excess kurtosis. The descriptive statistics shown in Table 1 indicate that, with the exception of the exchange rate all the variables have a positive means with the consumer price index having the highest mean. Exchange rate has the highest standard deviation of 1.387 and dollarization has the lowest of 0.228 levels. All the variables have positive standard deviation in levels and first differences. This is demonstrated that the exchange rate has been more volatile or has been associated with high rate of variability over the period.

Source: Hajia Ayisheyu, 2016

Table 2: Summary statistics of first differences of variables

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Dollarization</th>
<th>Exchange Rate</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.710142</td>
<td>-0.754725</td>
<td>3.304198</td>
</tr>
<tr>
<td>Median</td>
<td>0.806710</td>
<td>-0.142255</td>
<td>3.672534</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.895389</td>
<td>1.431865</td>
<td>5.319027</td>
</tr>
<tr>
<td>Minimum</td>
<td>-0.368665</td>
<td>-3.491341</td>
<td>0.0604831</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.227608</td>
<td>1.387460</td>
<td>1.374540</td>
</tr>
<tr>
<td>Skewness</td>
<td>-2.321951</td>
<td>-0.545603</td>
<td>-0.447055</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>8.136614</td>
<td>2.119127</td>
<td>1.950768</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>629.3520</td>
<td>25.81252</td>
<td>24.94170</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000000</td>
<td>0.000002</td>
<td>0.000004</td>
</tr>
<tr>
<td>Observations</td>
<td>315</td>
<td>315</td>
<td>315</td>
</tr>
</tbody>
</table>

Source: Hajia Ayisheyu, 2016

4.1.1 Diagnostic tests

In order to determine the order of integration and stationarity properties of the variables, two most widely used tests for unit root analysis; the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests are employed. The null hypothesis for both tests is that each variable contains unit roots. In other words, the variables are non-stationary. The results are presented in Table 3. According to the estimates, both tests fail to reject the null hypothesis that the variables contain unit roots when only a constant is included in the levels. First differencing the series eliminates the non-stationarity components and the null hypothesis of non-stationarity is rejected at conventional levels by both the ADF and PP tests. As a robustness check, the KPSS test was used. The null hypothesis for this test is that, the variable is stationary or follows a stationary process (or contains no unit root). The null hypothesis is not rejected if the estimated test statistic is less than the asymptotic critical values. The KPSS test confirms the ADF and PP tests, suggesting that all the variables are integrated of order one, I(1).

Table 3: Unit root and stationarity tests

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Dollarization</th>
<th>Exchange Rate</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.003966</td>
<td>0.001541</td>
<td>0.001503</td>
</tr>
<tr>
<td>Median</td>
<td>0.001272</td>
<td>0.0007932</td>
<td>0.0013619</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.173783</td>
<td>0.632550</td>
<td>0.120419</td>
</tr>
<tr>
<td>Minimum</td>
<td>-0.119404</td>
<td>-0.556931</td>
<td>-0.035622</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.025403</td>
<td>0.0081821</td>
<td>0.0016033</td>
</tr>
<tr>
<td>Skewness</td>
<td>2.486769</td>
<td>0.968221</td>
<td>1.280083</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>22.21515</td>
<td>36.92862</td>
<td>9.163876</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>5154.284</td>
<td>15109.95</td>
<td>578.4887</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Observations</td>
<td>314</td>
<td>314</td>
<td>314</td>
</tr>
</tbody>
</table>

Note: Critical values for ADF/PP are -2.87 (C) and -3.42 (C/T) and KPSS are 0.463 (C) and 0.146 (C/T)

4.2 Correlation

In order to explore the association or connection between the variables, the correlation coefficients are calculated. Table 4 presents the correlation coefficients of dollarization, exchange rate, and inflation. The results indicate that, the variables are positively and significantly correlated with the other variables. The correlation between exchange rate and inflation is much stronger (0.99), followed by the correlation between dollarization and exchange rate (0.85).

Table 4: Correlation matrix

<table>
<thead>
<tr>
<th>Dollarization</th>
<th>Exchange Rate</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollarization</td>
<td>1</td>
<td>0.8466</td>
</tr>
<tr>
<td>Exchange Rate</td>
<td>0.8466</td>
<td>1</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.8263</td>
<td>0.9891</td>
</tr>
</tbody>
</table>

4.3 Cointegration

The results of the unit root and stationarity tests indicated that the variables are I(1). This implies that a test for co-integration can be performed to test the possibility of a long-run equilibrium relationship between the variables under consideration. However, as the estimation of econometric models is sensitive to the number of lags used, different information criteria (IC) are utilized to select the optimal lag length. Table 4 reports the VAR-based lag order selected by the Akaike IC (Akaike, 1973), the
Schwarz IC (Schwarz, 1978), and the Hannan-Quinn IC (Hannan & Quinn, 1979). These selection criteria have different predictive abilities in identifying the most appropriate model in respect of the relationship under consideration. With sufficiently large sample size, the SBC and HQC are generally more consistent in terms of predicting the exact model. As the AIC is well known for generally show bias towards models with the least parsimony, the SBC also shows bias towards the models with the most parsimony (that is, with the least number of freely estimated parameters). All the criteria selected 2 as the optimal lag length.

Table 5: VAR Lag Order Selection Criteria

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-169.20</td>
<td>na</td>
<td>0.000616</td>
<td>1.121838</td>
<td>1.158</td>
<td>1.1364</td>
</tr>
<tr>
<td>1</td>
<td>1942.62</td>
<td>4168.62</td>
<td>6.92e-10</td>
<td>-12.57735</td>
<td>-12.43</td>
<td>-12.58</td>
</tr>
<tr>
<td>4</td>
<td>2097.54</td>
<td>10.9487</td>
<td>3.01e-10</td>
<td>-13.41086</td>
<td>-12.937</td>
<td>-13.221</td>
</tr>
<tr>
<td>7</td>
<td>2123.15</td>
<td>7.24556</td>
<td>3.04e-10</td>
<td>-13.40161</td>
<td>-12.600</td>
<td>-13.081</td>
</tr>
</tbody>
</table>

Notes: LR: sequential modified LR test statistic (each test at 5% level). Final prediction error (FPE), * indicates lag order selected by the criterion.

Analysis of Long-Run Relationships

The dynamic interrelationships between the macroeconomic variables under consideration will be measured under vector autoregression or error correction (EC) models. The EC model allows for both the short-run and long-run interactions of the variables in the study. A key component of the error correction model is the error correction term, which is the mechanism through which the system of equations readjusts the deviations from equilibrium in the long-run.

The Johansen co-integration test is implemented to obtain the number of co-integrating vectors in each model. The co-integration test restricts the coefficient for the deterministic trend in our data to zero, and specifies the co-integrating equation by assuming that there is just an intercept and no trend. Analysis of the trace and maximum eigenvalue test statistics at the 0.05 (5%) significant level and their corresponding p-values from the (Tiwari, 2011) for the null and alternative hypothesis is given in table 6. The results indicate that both the trace test and maximal eigenvalue reject the null hypothesis of no co-integration at the 5% level. This presents evidence that there is a co-integrating relationship between dollarization, exchange rate, and inflation.

Table 6: Johansen Co-integration test

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Test Statistic</th>
<th>Critical Value</th>
<th>Probability**</th>
</tr>
</thead>
<tbody>
<tr>
<td>λmax</td>
<td>0.079</td>
<td>36.987*</td>
<td>29.797</td>
<td>0.01</td>
</tr>
<tr>
<td>λmin</td>
<td>0.079</td>
<td>25.575*</td>
<td>21.131</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Notes: Number of lags included is 2. Arrangement of series: DR, X, and P. H0: There is no long-run relationship between the variables. Trend assumption: Linear deterministic trend. * denotes rejection of the hypothesis at the 0.05 level.** (Tiwari, 2011) p-values

Table 7: Long-run and adjustment coefficients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Normalized coefficients Coefficient</th>
<th>Standard error</th>
<th>Co-integrating Coefficient</th>
<th>Standard error</th>
<th>Test statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollarization</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>(4.333)</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>2.065*</td>
<td>(0.509)</td>
<td>(4.053)</td>
<td>(0.05)</td>
<td>(4.053)</td>
</tr>
<tr>
<td>Inflation</td>
<td>3.015*</td>
<td>(0.590)</td>
<td>(5.923)</td>
<td>(0.05)</td>
<td>(5.923)</td>
</tr>
<tr>
<td>ECT</td>
<td>-0.133*</td>
<td>(0.028)</td>
<td>(4.016)</td>
<td>(0.05)</td>
<td>(4.016)</td>
</tr>
</tbody>
</table>

Notes: * indicates significance at 5 percent level

Since the Johansen co-integration tests indicate a long run relationship between the variables in, the magnitude and direction of impact of the variables can be tested. If the long-run coefficients are normalized on the dollarization variable, the estimates of the elasticity of indicate that both exchange rate and inflation exert a positive shock on dollarization in the long-run. All the estimates are statistically significant at 1% level. This evidence is somewhat consistent with the reality, which is in support of the arguments held by a section of Ghanaians and some economists that, dollarization is the results of weakening macroeconomic fundamentals. An increase in the exchange rate (depreciation) causes the demand for foreign currencies to increase. Whereas a 1% increase in the exchange rate leads to 2.06% rise in dollarization, 1% increase in inflation will lead to 3.02% rise in dollarization.

Another interpretation of the long-run positive and significant relationship between dollarization and exchange rate by means of causality is that, with dollarization as the dependent variable and without changes in the other variables in the systems, a one percent increase in exchange rate causes the dollarization index to increase by between 2.06 percent in the long run. Also, considering the long-run relationship between dollarization and inflation, it can be said that, without innovations in the other variables, a shock to inflation can cause the dollarization index to rise by between 3.02 percent.

4.4 Analysis of the Short-Run Dynamics

4.4.1 Speed of adjustment

Following the evidence of a long run relationship between the variables, the VECM can be expected to
analysing the short run dynamics of the model. The model reports the error correction term (ECT), which indicates how short-run deviations from the equilibrium relationship are corrected according to the speed of adjustment. The coefficient of the lagged error correction term (ECT (-1)) is negative and statistically significant (i.e. -0.113). This indicates that, following a short run innovation or shock in dollarization, about 11.3% deviation from the long run equilibrium is corrected per month. A significant ECM(-1) coefficient means that all things being equal, whenever the actual value of dollarization rises above its long-term equilibrium rate, changes in the independent variables help bring it down to the long term equilibrium value. The size of the coefficient indicates that the speed of adjustment to equilibrium (whenever there is an imbalance) is 11.3%.

4.4.2 Impulse Response Functions

In order to evaluate the importance of each variable to variations or innovations in the other variable impulse response functions and variance decomposition are estimated based on the VAR model. Whereas the impulse response function measures the response of a variable to its own shocks or innovations and other variables, the variance decomposition measures the amount of deviations or movements in a variable that is explained or accounted by deviations or movements in other variables. The significance of the shock is produced by the two red bounds. When the two red bounds fall on the same side of the graph, it means it is remarkable; otherwise it would be deemed insignificant. Figure 3 reports the response of dollarization to generalise innovations in the other variables. At this stage, we are just interested in measuring the direction of response to one standard deviation shock. The dollarization index variable responds to shock in the other variables by rising. The statistic is mildly suggestive for the exchange rate shocks from the 5th to 10th months after the shock. In the case of the inflation, it becomes significant after 2 months and remains significant until about 10 months before it declines to become inconsequential.

Figure 4 also represents the response of the exchange rate to its own shocks and shocks emanating from the other variables. It is quite clear from the curve that, exchange rate increases in response to shocks originating from dollarization and inflation. Both become significant after 5 months. However, whereas it remains significant for a long time for dollarization, the effect of price shocks dies out and becomes insignificant after 30 months. This finding also suggests that the rising demand for foreign currencies in the Ghanaian economy weakens the Ghana cedi and causes it to depreciate. Also, the exchange rate depreciates in response to rising inflation in the economy consistent with dictates of the purchasing power parity. The impulse response functions for inflation presented in Figure 5 indicate that, inflation rise in response to shocks from dollarization and exchange rates. However, the dollarization shock is not statistically significant as the two red lines fall apart. In the case of the exchange rate shocks, it remains meaningful for over 5 years. This also signals the crucial role played by exchange rates in the price formation process in Ghana. A depreciation of the Ghana cedi causes inflation to rise. This is true considering the high import content of consumable goods in Ghana.

Figure 3: Response of Dollarization to Generalized One S.D. Innovations ± 2 S.E.

![Figure 3](image_url)

Figure 4: Response of Exchange rate to Generalized One S.D. Innovations ± 2 S.E.

![Figure 4](image_url)
of the h-step ahead forecast error variance of a variable is explained by innovations in other variable?” As discussed in (Ehrmann, Ellison, & Valla, 2003) and (Narayan, 2005), the ordering of the variables is important in deriving the h-step ahead forecast error variance decompositions. To this end the Cholesky decomposition of the variance–covariance matrix of error terms is applied to orthogonalize shocks. Table 8 presents the variance decomposition of the dollarization index for 60 months (5 years). The results indicate the important role played by the exchange rate in the dollarization process. Almost 15 percent of variations in dollarization can be explained by variations in the exchange rate over the 5 year period. Only about 4 percent of such deviations can be explained by price movements, whereas the remaining 80 percent is explained by dollarization itself. According to the variance decomposition of exchange rate reported in Table 8, both dollarization and inflation account for about 7 percent each of variations in the exchange rate and the exchange rate itself explains the remaining 86 percent. This also suggests that exchange rate variability is caused by its own shocks or innovations. Table 8 also presents the forecast error variance decomposition of inflation for 60 months. The significant role of the exchange rate on the price formation process is depicted here. A shock on exchange rate accounts for over 2 percent of variations in inflation within 6 months and tripled to over 12 percent in 12 months. The enormous contribution of the exchange rate to inflation is manifested throughout until it reached almost 42 percent of deviations in 60 months. At that stage, dollarization accounts for only about 6 percent of the variations. Exchange rate fluctuations in Ghana hold crucial implications for macroeconomic management as it contributes to the formation of prices and other important macroeconomic variables.

4.4.3 Variance Decomposition
Under this section, the forecast error variance decomposition is used to determine the proportion of the movements in each variable that is due to “own” shocks, versus shocks innovations emanating from the other variables. The question is, “how much

4.4.4 Granger Causality
The final step in the analysis is to test the existence of causal relationships between dollarization, exchange rate, and inflation using both the pairwise
Granger causality procedure and the Block exogeneity Wald test. The pairwise Granger causality reported in Table 9 considers the causal relationship between two variables. The null hypothesis that one variable causes the other is tested by using the p-value. The report provides some interesting findings to corroborate the earlier evidence. Considering the influence of exchange rate, it is clear that the null hypothesis that exchange rate does not Granger cause dollarization and inflation are both rejected. This confirms that exchange rate plays a very significant role in the Ghanaian economy. Again, the null hypothesis that inflation does not Granger cause dollarization is rejected. On the contrary, the null hypothesis that dollarization does not Granger cause exchange rate cannot be rejected. Similarly, the null hypothesis that dollarization does not Granger cause inflation is also not rejected. Both exchange rate and inflation Granger cause dollarization but dollarization does not Granger cause any of the two variables. This confirms the argument that dollarization is rather the consequence of weakening macroeconomic fundamentals and not the cause of macroeconomic instability in Ghana. No directional causality was found from dollarization to exchange rate and inflation, suggesting that the past values of dollarization do not significantly explain exchange rate and inflation in Ghana. The unidirectional causality from exchange rate to dollarization inflation suggests that the past values of exchange rate significantly explain those variables.

The chapter examined the short-run and long-run relationships between dollarization, exchange rates, and inflation in Ghana. To do that, ADF and PP unit roots tests as well as the KPSS procedures were undertaken to establish integrated and stationary properties of the variables. The tests established the existence of unit roots in the three variables. These variables were deemed to be integrated of order one, meaning that by differencing them once, they become stationary. Both the trace and maximum eigenvalue tests of the Johansen co-integration approach were used to determine whether the variables share and long-run relationships. Determining the existence of co-integration and number of such relationships was necessary considering that they were integrated. The study revealed that the variables were co-integrated. In other words, these variables share a common trend or move together in the long run. The study concluded by examining the direction of causality between these variables. The evidence indicated that the exchange rate is very significant in the determination of dollarization and inflation in both the short-run and long-run.

5.0 CONCLUSIONS
The ADF and PP unit roots and KPSS tests were used to determine the degree of integration of the proxy for dollarization, exchange rates, and prices. The tests established the existence of unit roots in the levels of the three variables. Again, these variables were thought to be stationary after differencing each of them once. This confirmed that the variables were integrated of order one, which is a mandatory requirement for co-integration analysis. After confirming the degree of integration of the variables, the Johansen co-integration approach was put in place to determine whether the variables share any long run relationships. The finding is that the
variables were co-integrated, suggesting a common tendency or co-movement of the variables in the long run. Further, it was reported that there is a positive effect of exchange rate and inflation on dollarization in the long-run. This co-movement brings to bear the predictability of any of the variables using the behaviour of the other variables. After examining the direction of causality between the variables, it was found that both inflation and exchange rate Granger cause dollarization and exchange rate Granger cause inflation. There was no causality running from inflation to exchange rate. No directional causality was found from dollarization to exchange rate and inflation, suggesting that the past values of dollarization do not significantly explain exchange rate and inflation in Ghana. The unidirectional causality from exchange rate to dollarization inflation suggests that the past values of exchange rate significantly explain those variables.

The first objective of the study was to ascertain if there are relationships between dollarization, exchange rate, and inflation in Ghana over the period January 1990 to March 2016. It was found that there are significant short-run and long run relationships between the variables. The long-run coefficients indicate a positive effect of exchange rate and inflation on dollarization. The second objective was to analyse the response of variables to shocks from the other variables. It can be concluded that, the effect of innovations to exchange rate on both dollarization and inflation is positive and both variables respond by rising. The third objective was to examine the causal links between dollarization, exchange rate, and inflation. It was found out that there are unidirectional causal links from the exchange rate and inflation to dollarization, and also from exchange rate to inflation. The evidence indicated that the exchange rate is very significant in the determination of dollarization and inflation in both the short-run and long-run.

Based on the above conclusions, the following policy recommendations are worth noting. First, the positive effect of exchange rate and inflation on dollarization means that the ability of the Bank of Ghana to control dollarization depends on its ability to control high rates of exchange rate depreciation and high inflation. Also, since persistent depreciation is likely to present deleterious inflation it suggests that the major task for the monetary authority is to control exchange rates. The results of the variance decomposition of exchange rate shocks indicate that almost a larger proportion of exchange rate movements are self-driven. The implication of this result is the case that, since exchange rate volatility is almost caused by its own shocks and expectations of further instability, unbridled interventions by the monetary authorities may not only exacerbate volatility, but may also be costly in terms of output and welfare. The Bank of Ghana must work on how to improve its exchange rate modelling and forecasting ability at the central bank level, while incorporating the impact of other variables in budgetary policy. This would improve both the transparency and functioning of the foreign exchange market.

One of the pillars of the inflation targeting monetary policy currently in use by the Bank of Ghana is transparency and accountability. There is the need to strengthen the communication channels of the bank in order to properly anchor economic agents’ expectations regarding exchange rate and inflation. Whereas much debate has ensued on whether dollarization causes weaknesses in macroeconomic fundamentals or otherwise, the Bank of Ghana needs to conduct research to determine the amount of foreign currencies in circulation, the optimal level of dollarization, and the institutional factors responsible for the high demand for foreign currencies. Although an attempt has been made to determine the relationship between dollarization and some other variables, the nature of the subject matter and its relevance for both fiscal and monetary policymaking necessitates more empirical inquests as more and rich data become accessible. Other future researchers can focus on the effects of dollarization on macroeconomic variables so as to provide evidence to support the strategies employed by the Bank of Ghana to curb dollarization and control exchange rate depreciation and inflation. The ability of monetary authorities to adequately confront the matter hinges on a proper understanding of the various forms of dollarization in the economy, as different strategies are required. A more advanced measure of dollarization that incorporates all forms of dollarization would be required to ensure a more befitting judgment of its consequences for macroeconomic policymaking in Ghana.

REFERENCES


