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EXCHANGE RATE AND COST OF CREDIT FLUCTUATIONS IN GHANA BEFORE AND AFTER INFLATION TARGETING FRAMEWORK

BY

PATRICK GLAVEE

A thesis submitted in partial fulfillment of the requirement for the degree

Master of Science

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THESIS ACCEPTANCE PAGE

Patrick Glavee

This thesis is approved as a creditable and independent investigation by a candidate for the master's degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Advisor Date

Department Head Date

Dean, Graduate School Date

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ABSTRACT

EXCHANGE RATE AND COST OF CREDIT FLUCTUATIONS IN GHANA BEFORE AND AFTER INFLATION TARGETING FRAMEWORK

PATRICK GLAVEE

2020

Fluctuations in exchange rate and cost of credit affect most economies in the world. The problem arises with the uncertainty it generates and the challenges it poses to the economy. The volatility of the exchange rate has been studied extensively in the extant literature, but the problem continues to persist. This paper therefore investigates whether inflation targeting framework influences the exchange rate and cost of credit in Ghana using data from February 2001 to March 2019. Using vector autoregressive model and vector error correction model, the study reveals that the exchange rate situation improves in both the short and long run after the imposition of the inflation targeting framework. Also, in the short run, the cost of credit reduces after the policy, but it is insignificant in the long run.

EXCHANGE RATE AND COST OF CREDIT IN AN INFLATION TARGETING REGIME: THE CASE OF GHANA

1 INTRODUCTION

Many countries are bedeviled with the problem of exchange rate fluctuations and high cost of credit (the interest rate and fee charged on short term loans by commercial banks to firms). Large swings in the exchange rate and the cost of credit are a major source of uncertainty in most economies and these affect trade flows and general economic activity. For instance, the foreign liabilities in developing countries are denominated in foreign currencies, therefore a fall in the value of the local currency increases the value of the liability (Bénassy-Quéré et.al, 2010). Policymakers are therefore challenged to enact policies to address this concern.

The uncertainty caused by large swings in the exchange rate and the cost of credit is exacerbated during periods of economic crisis. The global financial crisis of 2007 was a negative external shock to most economies in the world including those in Africa. As the crisis intensified, small economies were affected indirectly, mostly due to restriction in trade and international flow of capital (Rose, 2014). For example, in Ghana, during the global financial crisis, the nominal exchange rate of the local currency depreciated by 6.0 percent, 11.7 percent and 4.6 percent against the US dollars, euro, and the pound sterling, respectively, in the second quarter of 2018 (Bank of Ghana, 2009b).

Theoretically, a low and stable price level influences the behavior of the exchange rate and the cost of credit. Stated differently, even though monetary policy targets the internal value of a currency while exchange rate policy focuses on its external value, the

two are related (Bénassy-Quéré et.al, 2010). Also, in an open economy, issues of exchange rate concern the monetary policy (Ball, 2000). On this premise, I investigate the effectiveness of a recently adopted monetary policy framework, termed inflation targeting framework on the exchange rate and cost of credit in Ghana.

In this study, I investigate the inflation targeting framework on the exchange rate and cost of credit in Ghana because it is the first country in West Africa to adopt this framework (in 2007), and because of the availability of enough data for decision making. The economy of Ghana is import dependent, hence, it relies heavily on the external sector. Also, its main exports are primary products, and this makes the economy susceptible to external shocks. Further compounding the problem of exchange rate and cost of credit volatility is when Ghana transitioned from a controlled monetary regime to a liberalized regime which began in 1983. This reform was instigated by the launch of the Economic Recovery Program/Structural Adjustment Program (ERP/SAP) and Financial Sector Adjustment Program (FINSAP) (Bawumia et al., 2008). As part of the reforms, monetary aggregate targeting was adopted and exchange rate controls, interest rate controls and credit ceilings that were practiced in the controlled regime were removed. The removal of the controls transitioned the economy of Ghana to one that is market oriented (Adu et al, 2015) as the macroeconomic variables are now controlled by the forces of demand and supply. The liberalization coupled with the vulnerability of the Ghanaian economy has caused substantial swings in the exchange rate and the cost of credit. For instance, since the managed floating exchange rate regime[1] was adopted, the local currency has constantly

[1] In 1987, Ghana transitioned from fixed exchange rate to the managed float exchange rate. The managed system came with a dual exchange rate where foreign currencies were auctioned. In the first window of the auction, the rate was fixed at an official rate. This auction was for the official

seen nominal depreciation against the US dollar with few episodes of appreciations (Asafo, 2019). This development is always captured in the Association of Ghana Industries' business barometer (a survey on the business confidence in Ghana) report. The report has consistently cited exchange rate and cost of credit as the major challenges faced by businesses.

The medium term inflation target band in Ghana is 8 ± 2 percent using the annual rate of the consumer price index. This target band is in line with the objective of attaining the desired long-term average growth objective for Ghana (Bank of Ghana, 2019). The central bank uses the monetary policy rate to keep the inflation rate within the inflation target range. The monetary policy rate is chosen based on an inflation forecast. The inflation forecast model used by the bank of Ghana includes an error correction model, autoregressive forecasting model and a macro econometric model (Bawumia et al., 2008). The final decision is however not mechanically based on the forecasts. The decision is usually discretionary after a careful analysis of all economic data and risks. Also, Ghana targets the core consumer price index (CPI) which excludes energy and utility prices (Bawumia et al., 2008). All inflation targeting countries target the consumer price index (CPI), however, the items included in the measurement differ (Smith, 2008). The extant literature has it that the countries that adopt the headline CPI as the target for the inflation

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government transaction and import of important commodities like crude oil and essential drugs. In the second window, the rate was determined by demand and supply and it covers all other transactions not captured in the first window (Sanusi, 2010). The first window was later abolished, leaving only the market-determined auction window. Successive development led to the adoption of the flexible exchange rate regime where exchange rate was determined by the market forces. However, the Bank of Ghana intervenes where necessary. The bank does this by buying and selling the foreign currency to regulate the external value of the local currency. This is the new form of managed floating practiced in Ghana.

targeting framework outnumber those that adopt the core CPI (Schaechter et al., 2000; Carare et al., 2002; Schmidt and Tapia, 2002). The headline CPI has the advantage of being readily available to the public, hence its use provides transparency and credibility. However, the headline CPI includes some components (this includes, but is not limited to, food and energy prices, mortgage costs and indirect taxes) that are very volatile and hence difficult to be controlled by the central bank. Due to this setback, some countries target the core CPI, where some of the components included in the headline CPI are excluded. There is, however, a disadvantage of it suffering from a credibility issue as central banks can manipulate the data but Carare et al. (2002) explains that the credibility can be improved if the compilation of the core CPI is done by an independent body. Ghana's CPI is compiled by Ghana Statistical Service, which is an independent body, hence some level of credibility can be guaranteed.

On the domestic economy, the inflation targeting framework helps reduce the "sacrifice ratio", which is the employment or output to be given up to lower inflation by a certain amount (Heintz and Ndikumana, 2010). This means that the cost of lowering inflation is lower under an inflation targeting framework than other monetary policies. Also, because the central bank strives to attain an inflation target or range, its accountability rises, and this lessens the possibility of falling into the time inconsistency trap (Mishkin, 2000). Bernanke et al. (1999) characterizes the time inconsistency trap as a policy credibility problem where the central bank in a bid to stimulate employment and output in the short run, increases the inflation rate after it has announced a lower inflation rate. Once the public understands this deceptive nature of the central bank, they adjust their expectations accordingly and this can create inflationary pressures (Kydland and Prescott,

1977). In an inflation targeting regime, this situation is lessened as the priority of the central bank is to target only the price level.

Empirical studies on inflation targeting and the exchange rate generally show mixed result. For instance, Rose (2007) and Prasertnukul et al. (2010) found that inflation targeting reduces exchange rate volatility, Berganza and Broto (2012), and Ouyang et al. (2016) also found that exchange rate varies more for inflation targeting countries and Petursson (2004) and Edwards (2006) found no evidence. Similarly, there is also a mixed result for the cost of credit. For instance, Matheo and Reginaldo (2013) found a reduction in the nominal interest rate, Neuman and Von Hagen (2002) found that the short and long term interest rates for IT countries were less volatile compared to non-IT countries and Freeman and Willis (1995) found an increase in real long term interest rates.

This study makes two contributions to the literature. First, per my observation, this is the first paper that studies the impact of inflation targeting on cost of credit in Ghana. The importance of cost of credit to the economy of Ghana cannot be overemphasized. For instance, cost of credit is the cost of borrowing, therefore, a lower cost of credit induces investment and economic growth (Kwakye, 2012). Also, lower cost of credit reduces general price level as cost-push inflation declines. Again, this study is important as it determines the credibility of the policy. The reason is that credibility of the policy anchors inflation expectation to the inflation target and this lowers the interest rate required to stabilize the price (Lanzafame and Nogueira, 2013). The credibility of the central bank increases as the actual inflation move toward the inflation target. This means, it relates negatively to the difference between inflation expectations and the inflation target. There is therefore a loss in credibility when the difference widens.

Second, few researchers like Fosu (2015), have studied the impact of the policy on the exchange rate in Ghana. The uncertainty that emanates from an unstable exchange rate impedes investment, therefore, exchange rate stability is important to promote investment and growth in the Ghanaian economy. Unlike Fosu (2015) who used yearly data, I used monthly data. The use of monthly data increases the number of observations. Also, Fosu (2015) used the year when the informal inflation targeting started (2002) while this study considers when the formal inflation targeting began (2007). Lastly, Fosu (2015) incorporated a dummy variable to reflect the impact of the policy while this study estimates the period before (Pre-IT) and after the policy (Post-IT) separately using a Vector Autoregressive (VAR)/Vector Error Correction Model (VECM). The choice for VECM becomes necessary as the variables are integrated of order one. Also, the choice of VECM is motivated by the objective of the study to investigate both the short and long run conditions of the exchange rate and cost of credit.

The first finding from this study is that, in the short run, the local currency depreciates in the pre-IT period but appreciates in the post-IT period. In the long run, in the pre-IT period, the local currency appreciates in the first period but depreciates at the following month. Conversely, after the imposition of the policy, the local currency appreciates at the first month, but does not depreciate subsequently, rather, the magnitude of the appreciation reduces in the second month. Also, to capture the effect of external shock on exchange rate in both periods, I include external variables like the US dollar/euro exchange rate, US CPI and US federal interest rate. The result indicates that the effect of the US dollar/euro exchange rate on nominal exchange rate in Ghana reduces in the post-IT period in both the short and long run.

The second finding is that, in the short run, the cost of credit in the pre-IT period has increased more than the post-IT period. In the long run, the cost of credit is higher in the post-IT period than the pre-IT period. The result also shows that, in the period before the policy, external shock increases the cost of credit in both the short and long run. The magnitude of the impact increases in the long run. The result, however, shows no impact of the external sector on the cost of credit in the period of the policy.

The rest of the paper is organized into four chapters. In chapter two, I discuss the models, the data, the variables for the study and estimation of the models. In chapter three, I analyze the results from estimating the models. Lastly, in chapter four, I discuss the conclusion and make recommendations.

2 ESTIMATION METHODS AND PROCEDURES

In this chapter, I present the empirical model and the variables that I use to estimate the short and long run impact of the inflation targeting policy on the exchange rate and cost of credit. Thus, this chapter looks at the model, estimation techniques, the sources and descriptions of the variables for the study.

2.1 Methodology

To determine the short and long term policy implications of inflation targeting on the exchange rate and cost of credit, this paper adopts the VAR and the VECM. A VAR model with exogenous variables is expressed as

$$Y_t = \beta_0 + \sum_{i=1}^{k} B_i Y_{t-i} + CX_t + e_t \qquad (1)$$

Y_t is a vector of all endogenous variables in the system, β_0 is the drift component, and t indicates time. Y_{t-i} is the lagged values of the endogenous variables, B_i is the coefficient, the e_t is a vector of reduced-form errors, X_t characterizes the vector of exogenous variables in the model and C is the corresponding coefficient.

Following the VAR model above and the objectives of this paper, the model can be specified as

$$EXCH = \beta_0 + \sum_{i=1}^{k} \beta_1 EXCH_{t-i} + \sum_{i=1}^{k} \beta_2 COC_{t-i} + \sum_{i=1}^{k} \beta_3 MS_{t-i} + \sum_{i=1}^{k} \beta_4 CPI_{t-i} + \sum_{i=1}^{k} \beta_5 PSC_{t-i} + \beta_6 X_t + \varphi ECT_{t-i} + e_t \quad (2)$$

$$COC = \beta_0 + \sum_{i=1}^{k} \beta_1 EXCH_{t-i} + \sum_{i=1}^{k} \beta_2 COC_{t-i} + \sum_{i=1}^{k} \beta_3 MS_{t-i} + \sum_{i=1}^{k} \beta_4 CPI_{t-i} + \sum_{i=1}^{k} \beta_5 PSC_{t-i} + \beta_6 X_t + \varphi ECT_{t-i} + e_t \quad (3)$$

Where EXCH is the log nominal effective exchange rate, COC is cost of credit, MS is the log of money supply, CPI is the log of consumer price index, PSC is log of private sector credit and X is the external shock which is measured by the nominal exchange rate of US dollar to the euro, the US CPI, and the one-year constant maturity rate of a US treasury bond. I use the current values of the exogenous variable because the VAR model does not include lags to the exogenous variables.

In the case where the variables of a VAR are cointegrated, the VECM is used. The VECM has the advantage of incorporating both long and short run relationships among variables. Also, because VECM is a full maximum likelihood estimation model, its estimators are efficient (Maysami and Koh, 1998). The VECM following Marques et.al (2014) can be expressed as

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p-1} B_i \Delta Y_{t-i} + C\Delta X_t + \varphi ECT_{t-i} + e_t \quad (4)$$

Y_t is a vector of variables, Δ represents the first difference operator, $\sum_{i=1}^{k} B_i \Delta Y_{t-i}$ is the first difference of the vector autoregression (VAR) component, the ECT_{t-i} is the error correction term and the e_t is the error term. Also, the coefficient of ECT_{t-i}, φ implies the speed of adjustment. The error correction term measures the impact of how the growth rate of a variable changes. If one of the variables deviates from its long run equilibrium values, a larger value of φ signifies faster adjustment.

Following the VECM model above and the objectives of this paper, the model can be specified as

$$\Delta EXCH = \beta_0 + \sum_{i=1}^{k} \beta_1 \Delta EXCH_{t-i} + \sum_{i=1}^{k} \beta_2 \Delta COC_{t-i} + \sum_{i=1}^{k} \beta_3 \Delta MS_{t-i} + \sum_{i=1}^{k} \beta_4 \Delta CPI_{t-i} + \sum_{i=1}^{k} \beta_5 \Delta PSC_{t-i} + \beta_6 \Delta X_t + \varphi ECT_{t-i} + e_t \quad (5)$$

$$\Delta COC = \beta_0 + \sum_{i=1}^{k} \beta_1 \Delta EXCH_{t-i} + \sum_{i=1}^{k} \beta_2 \Delta COC_{t-i} + \sum_{i=1}^{k} \beta_3 \Delta MS_{t-i} + \sum_{i=1}^{k} \beta_4 \Delta CPI_{t-i} + \sum_{i=1}^{k} \beta_5 \Delta PSC_{t-i} + \beta_6 \Delta X_t + \varphi ECT_{t-i} + e_t \quad (6)$$

Again, I use the current values of the exogenous variable because the VECM model does not include lags to the exogenous variables.

2.1.1 The Dornbusch's Overshooting model

Dornbusch (1976) develops a simple model that studies fluctuations in exchange rate which is described as the exchange rate overshooting model. Under the assumption of perfect capital mobility, price stickiness, consistent expectations, and slight adjustment of the goods market in relation to the asset market, the exchange rate overshooting model

explains that changes in monetary policy cause the exchange rate to be highly volatile. For instance, monetary expansion reduces interest rate and increases the interest rate differential between the world interest rate and the domestic interest rate. By the uncovered interest rate parity, the increased interest differential favors foreign-denominated assets as investors reposition their assets to avoid losses. The expected depreciation of the local currency coupled with the decline in the interest rate causes the exchange rate to overshoot (jump) its long run level. After this jump, the local currency is expected to appreciate (or retreat) until it reaches its expected depreciation level. Since the overshooting model rest on the assumption of price stickiness, then the exchange rate will overshoot more if inflation targeting makes price stickier. This theory is consistent with the purchasing power parity since by the quantity theory of money, monetary expansion increases the price level, hence depreciating the local currency in the long run.

2.1.2 Variable Description and Justification

The variables used in this study are some of the economic indicators that inform the choice of monetary policy rate of the Bank of Ghana.

The nominal effective exchange rate is an endogenous variable in this model. This variable is an index which measures the value of Ghana's currency against a weighted average of several foreign currencies. In an inflation targeting regime, the objective is to lower and stabilize the general price level. This is achieved by reducing the gap between actual inflation rate and the inflation target. Ivrendi and Guloglu (2010) explains that the success of inflation targeting lowers inflation in countries that start with high inflation compared to those countries that start with low inflation. In the case of Ghana, the actual inflation rate is expected to reduce because Ghana started with high inflation rate.

Following the relative purchasing power parity, a reduction in inflation rate in Ghana is likely to cause an appreciation of the local currency, in the long run. On this basis, in the long run, the inflation targeting policy is expected to appreciate the local currency. This means that β_1 in the exchange rate equation is expected to be positive.

Also, the average commercial banks' lending rates is used as a proxy for cost of credit. This is defined as the average interest rate charged on short term loans by the commercial banks to firms. In a money demand and money supply model, a reduction in price level is likely to increase the real money supply and further reduce the interest rate. Also, the credibility required in an inflation targeting regime anchors inflation expectation to the inflation target. This means that a lower interest rate is required to keep a stable price level. We therefore expect the cost of credit to decline in an inflation targeting regime. This means that β_2 in the cost of credit equation is expected to be negative.

The study uses the consumer price index, which measures the average monthly price level of fixed basket of goods and services that households in Ghana consume. This variable is included to measure the effectiveness of the inflation targeting regime because the Bank of Ghana's primary reason for adoption in Ghana is to lower inflation. As explained above, if inflation targeting reduces the actual inflation rate, then the growth in the CPI must decline. A declining inflation rate increases the external value of the local currency hence the coefficient, β_4, is expected to be negative in the exchange rate equation. Also, since inflation rate is considered in the computation of the cost of credit, it is expected that the coefficient, β_4, will be negative in the cost of credit equation.

Private sector credit measures the amount of credit lent to the private sector. This variable is included to measure the relationship of demand for credit and the cost of credit

in inflation targeting regime and to capture the effect on the real sector of the economy. There exists a negative relationship between the private sector credit and cost of credit. That is, as the cost of credit declines, the private sector borrows more. The coefficient of the private sector credit, β_5, is expected to be positive in the cost of credit equation. Also, an increase in domestic investment because of private sector growth is likely to increase trade surplus, thus, appreciating the local currency. Again, in the exchange rate equation, β_5 is expected to be positive.

Money supply is the total amount of money in circulation in the economy at any given time. The money supply used in this paper is measured by broad money. The broad money includes currency outside banks, demand, saving, time, and foreign currency deposits of resident sectors other than the central government, bank and traveler's checks, and other securities such as certificates of deposit and commercial paper. In the traditional IS-LM model, a rise in the money supply reduces the interest rate and further increases the price level. Because the central bank intends to achieve low and stable price in an inflation targeting regime, it reduces the growth of money supply. A reduction in the growth of money supply reduces inflationary pressures hence boost the exchange rate and cost of credit. The coefficient β_3 is expected to be negative in both the exchange rate and cost of credit equation.

External shocks in the form of the nominal bilateral exchange rate of the US dollar to the euro (US_EURO), US consumer price index (US CPI) and the one-year constant maturity rate of a US treasury bond (TIR) are included in the model as exogenous variables. These variables are included in the model to determine the resilience of the inflation targeting framework to external shocks.

2.2 Data and Descriptive Analysis

This paper employs monthly time series data from February 2001 to March 2019. There are, thus, 218 observations in these data. These data are divided into before (pre-IT) and after (post-IT) the implementation of the policy. The inflation targeting policy in Ghana commenced in 2007 but to allow for the impact of the policy, I assume the effect on the variables is experienced a year later. That is, the pre-IT is from February 2001 to December 2007, and the post-inflation post-IT is from January 2008 to March 2019. The data are sourced from the Bank of Ghana, the International Monetary Fund, and the Federal Reserve Bank of St. Louis. The descriptive statistics of the variables are explained below. The descriptive statistics adopted in this study are the average mean and the standard deviation, the latter measures the volatility of the variables.

Table 1 presents the descriptive statistics of the variables used in this study. The table shows a reduction in the average exchange rate, cost of credit, and inflation after the adoption of the inflation targeting framework. For instance, the nominal effective exchange rate declines from approximately 190.15 to approximately 70.68, and the cost of credit reduces from 32.15 percent to 27.31 percent. Similarly, the volatility of these variables, which is measured by standard deviation, declines after the imposition of the policy. For example, the standard deviation of exchange rate before and after the policy are 39.36 and 30.94, respectively, while for the cost of credit, the standard deviation decreases from 7.23 percent to 2.38 percent.

Furthermore, the average and standard deviation of both the money supply and private sector credit increase after the imposition of the policy. For instance, the average money supply increases from 1,901.27 million cedis to 24,103.51 million cedis and private

sector credit increases from 1,164.67 million cedis to 17,253.48 million cedis. Again, the standard deviation of the money supply increases from 1,053.09 million cedis to 16,982.62 million cedis and private sector credit increases from 754.17 million cedis to 11,187.48 million cedis.

The study adopts the Wilcoxon rank sum test by applying the Mann-Whitney test. Since the t-test does not guarantee the normal distribution of the samples, the Mann-Whitney Wilcoxon test is the best approach. The table shows that all the variables are significant at 1 percent, hence we reject the null hypothesis and conclude that the two population are unequal with different medians. This result confirms that the differences in the means before and after the implementation of the inflation targeting policy are significant.

Table 1: Descriptive Statistics and Two-sample Wilcoxon rank-sum test

	PRE-IT		POST - IT		WILCOXON RANK SUM TEST
Variable	Mean	Standard Deviation	Mean	Standard Deviation	Z-Stats
Exchange Rate	190.419	39.3640	70.68287	30.94355	12.389***
Cost Credit	32.1478	7.2271	27.31407	2.379094	4.878***
Inflation	18.9301	8.8666	13.39733	3.819579	-12.380***
Money Supply	1901.27	1053.09	24103.51	16982.62	4.599***
Private Sector Credit	1164.67	754.1678	17253.48	11187.48	-12.389***

Table 1: result of descriptive statistics and Mann Whitney test. ***, ** and * indicates 1%, 5% and 10%, respectively.

2.2.1 Trends in Variables

This section investigates the trends in some of the variables used in the study. The vertical line demarcates the pre-IT period and the post-IT period. Figure 1 compares the impact of the central bank's monetary policy rate and inflation rate in the pre-IT and post-IT. It is evident that the inflation rate seems to be responding to the monetary policy rate in Ghana. That is, the correlation between the monetary policy rate and inflation rate is higher for the post-IT period.

Also, in Figure 2, the nominal effective exchange rate is seen to be declining most of the times with few episodes of increases. It seems that the value of the local currency has declined after the imposition of the policy. The real effective exchange rate also seems to have declined after the policy.

In Figure 3, the average commercial banks' lending rate in general is on the decline. However, at some periods, the lending rate remain constant or increases. The plot depicts that the lending rate is lower after the policy.

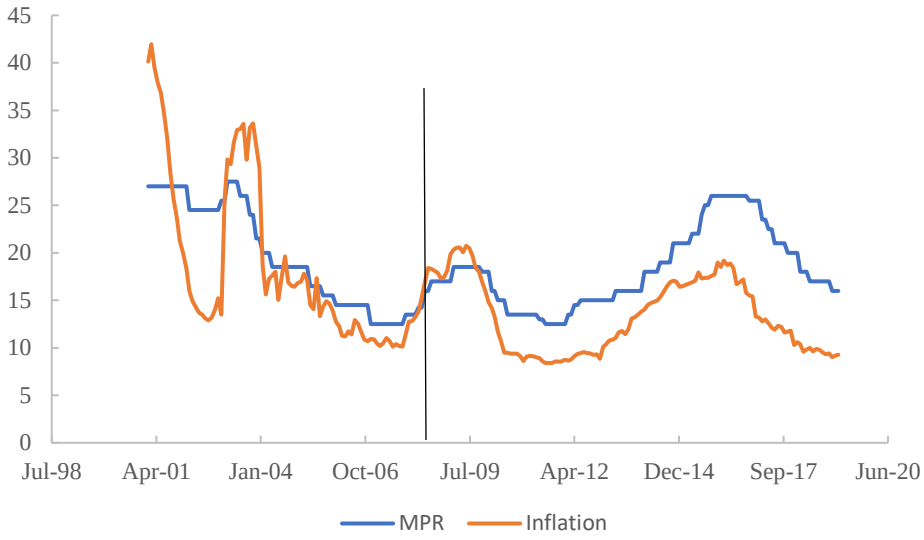

Figure 1: Trends in Monetary Policy Rate and Inflation Rate

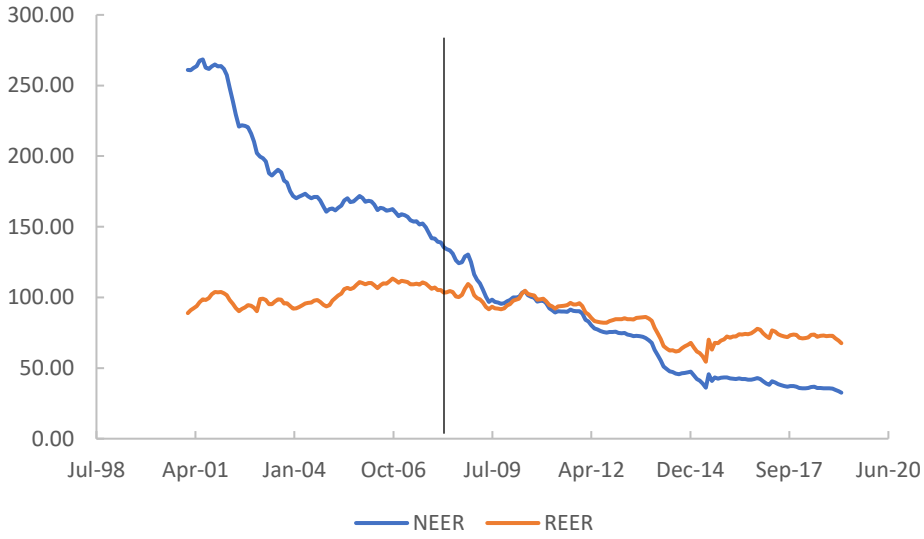

Figure 2: Trends in Exchange Rate

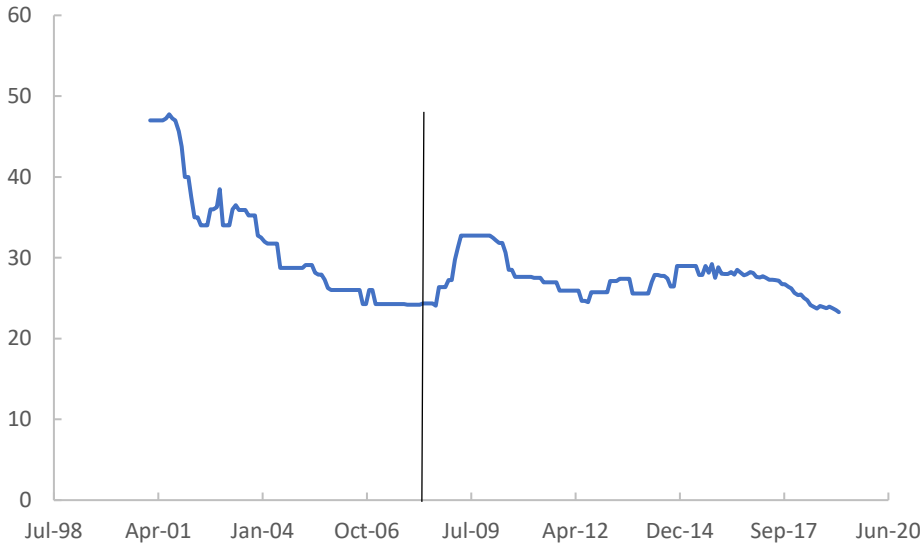

Figure 3: Trends in Average Commercial Banks' Credit

3 RESULTS AND DISCUSSIONS

This section discusses the results from the estimation technique adopted by this study as well as the several tests conducted.

3.1 Results of Unit Root Test

Table 2 presents findings of the Augmented Dickey Fuller and Phillip Perron test. At the levels, using the Augmented Dickey Fuller and Phillip Perron test, all the variables are found to be non-stationary. In their first difference, all the variables attain stationarity at the 1% alpha level. The variables are said to be *I* (1). This preliminary investigation guarantees VECM estimation. On this basis, I analyze the variables in their first difference to fit the VECM model.

Table 2: Augmented Dickey Fuller and Phillip Perron Unit Root Test at levels and first difference for both periods

		LEVELS		FIRST DIFFERENCE	
		ADF	PP	ADF	PP
Exchange Rate	Post-IT	-2.180	-2.129	-6.816***	-12.673***
	Pre-IT	-1.522	-1.232	-5.559***	-5.376***
Cost of Credit	Post-IT	-2.551	-2.309	-6.672***	-11.122***
	Pre-IT	-1.833	-1.992	-8.726***	-8.728***
Money Supply	Post-IT	-2.593	-2.875	-7.757***	-17.359***
	Pre-IT	-1.366	-2.334	-6.010***	-5.837***
Consumer Price Index	Post-IT	-1.368	-2.113	-8.214***	-7.039***
	Pre-IT	-2.254	-2.209	-6.242***	-6.242***
Private Sector Credit	Post-IT	-0.751	-0.878	-10.691***	-10.691***
	Pre-IT	-1.264	-1.148	-10.125***	-10.125***

Table 3: result of stationarity test at levels and first difference for both Pre-IT and post-IT.

3.2 Results of Lag Order Selection Criteria

Selecting the optimal lag is the first issue in VAR/VECM estimation. This test affords us the ability to determine the length of lags of the variables needed to estimate the VECM model. The choice of the optimal lag is necessary so that we do not waste degree of freedoms as caused by too many lags and not to encounter autocorrelation in residuals as caused by too few lags. To choose the optimal lag order, the underlying principle is that each of the Information criterion minimizes the mean squared error. Using several methods for choosing the optimal lag, Table 3 shows that, in both the pre-IT period, most of the information criteria, namely, sequential modified LR test and Akaike information criterion,

find the optimal lag to be 4. The study therefore adopts lag 4 as the optimal lag for the VAR/VECM estimation in both periods.

Table 3: Lag order selection criteria

	PRE-IT				POST-IT			
Lag	LogL	LR	AIC	SC	LogL	LR	AIC	SC
0	327.484	NA	-7.911	-7.461	285.861	NA	-4.135286	-3.806065
1	738.702	739.151	-17.689	-16.489*	1184.411	1687.354	-17.47193	-16.59401*
2	787.396	81.363	-18.289	-16.339	1223.158	69.803	-17.68180	-16.25518
3	818.912	48.670	-18.453	-15.754	1255.298	55.447	-17.79081	-15.81548
4	845.486	37.675*	-18.493*	-15.044	1289.553	56.482*	-17.93211*	-15.40808

Table 3: result of lag order selection criteria. * indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level, AIC: Akaike information criterion, SC: Schwarz information criterion.

3.3 Long-Run Dynamics

Results of the long run dynamics are obtained by VAR estimation. Table 4 presents the results of the long run impact of inflation targeting on the variables. The table presents all four lags for the exchange rate and cost of credit, and only the first lag of the other domestic variables and the current values of the external variables. I assume their current values because I incorporate the external variables in the model as exogenous variables. Models designated as (1) represent equations in the pre-IT period and those designated as (2) indicate equations in the post-IT period.

Table 4: Long Run VAR Estimates of the Variables

	EXCH RATE (1)	EXCH RATE (2)	COC (1)	COC (2)
EXCH RATE (-1)	0.7347***	0.7297***	12.8743	-1.7595
	(0.1358)	(0.1058)	(12.5132)	(2.0432)
EXCH RATE (-2)	-0.3883**	0.3286**	-5.3960	2.4673
	(0.1764)	(0.1335)	(16.2557)	(2.5779)
EXCH RATE (-3)	0.1132	-0.1885	-17.5541	-7.0214***
	(0.1824)	(0.1331)	(16.8135)	(2.5701)
EXCH RATE (-4)	0.0929	-0.0477	9.8927	6.6479***
	(0.1159)	(0.1040)	(10.6820)	(2.0081)
COC (-1)	0.0011	0.0039	0.6164***	0.8979***
	(0.0014)	(0.0047)	(0.1292)	(0.0917)
COC (-2)	0.0015	-0.0070	0.1157	0.0762
	(0.0017)	(0.0064)	(0.1553)	(0.1234)
COC (-3)	0.0036*	0.0019	0.2571	-0.1662
	(0.0020)	(0.0063)	(0.1870)	(0.1225)
COC (-4)	-0.0009	0.0039	-0.2806*	-0.0080
	(0.0015)	(0.0048)	(0.1414)	(0.0925)
CPI (-1)	-0.1975	-0.2762	-2.0715	-0.9965
	(0.1258)	(0.3378)	(11.5958)	(6.5226)
MS (-1)	0.0158	-0.1940	-5.3754	-1.8876
	(0.0467)	(0.1192)	(4.3057)	(2.3018)
PSC (-1)	0.0484	0.0202	-0.0718	-1.1546
	(0.0659)	(0.1493)	(6.0712)	(2.8818)
US EURO	-0.3011***	-0.1012**	11.0551**	-0.4803
	(0.0519)	(0.0472)	(4.7802)	(0.9110)
US CPI	0.6856***	0.4965***	11.8566	1.3110
	(0.1313)	(0.1611)	(12.0993)	(3.1097)
US TIR	0.0056***	0.0059	-0.0489	-0.3032
	(0.0021)	(0.0101)	(0.1933)	(0.1944)

Table 4: results of long run VAR estimates of the variables. ***, ** and * indicates 1%, 5% and 10%, respectively. The standard errors are in parenthesis. (1) and (2) are the pre-IT and post-IT period, respectively. Models designated as (1) represent equations in the pre-IT period and those designated as (2) indicate equations in the post-IT period.

The results in Table 4 present the findings of the long run exchange rate equation. The results show that only the first 2 lags of the exchange rate are significant for both periods. At lag 1, in the pre-IT period, the exchange rate significantly appreciates in the long run by 0.735 percent but depreciates subsequently by 0.388 percent. Conversely, In the post-IT period, the local currency appreciates by 0.73 percent, however, the local currency does not depreciate in the following period. Instead, the rate of appreciation

declines to 0.328 percent in the following period. The intuition is that after the imposition of the policy, the variability in the exchange rate is lower in the post-IT period than in the pre-IT period. Also, considering the changes in the dollar to euro exchange rate shocks on the exchange rate in Ghana, it is obvious that the shocks significantly reduces the value of the local currency by 0.301 percent but the effect is only 0.101 percent in the post-IT. This indicates that the post-IT period is more robust to external shocks than the pre-IT period. The US CPI shocks significantly impacts the exchange rate positively in both the pre-IT period and post-IT period, but the impact is higher in the pre-IT period. Lastly, the US treasury bond significantly appreciates the exchange rate in the pre-IT period but has no impact in the post-IT period.

Lastly, Table 4 presents findings of the cost of credit equation for both periods. The result of lag 1 indicates that in the long run, in the pre-IT period, the cost of credit significantly increases by 0.616 percent and declines by 0.281 percent at lag 4. In post-IT period, the cost of credit significantly increases by 0.898 percent, but it is insignificant in the other previous lags. Freeman and Willis (1995) also found that the interest rate increases in the country that adopted the inflation targeting framework. Poor policy credibility has been cited in the literature (Lanzafame and Nogueira, 2013) to be one of the reasons for the increase in interest rates in the inflation targeting regime. The dollar to euro exchange rate significantly increases the cost of credit by 11.06 percent in the pre-IT period in the long run at the 1% alpha level. However, in the post-IT period, the external shock has insignificant negative effect on the cost of credit.

3.3.1 Stability of the VAR Estimates

To determine the stability of the VAR model, I illustrate in Figure 1 the results of the AR Roots Graph. In Figure 1, the condition for the stability is met because the moduli for the eigenvalues are strictly less than unity. This means that the inverse roots of AR characteristic polynomial lie in the unit circle. That is, the VAR specification imposes 1 unit modulus.

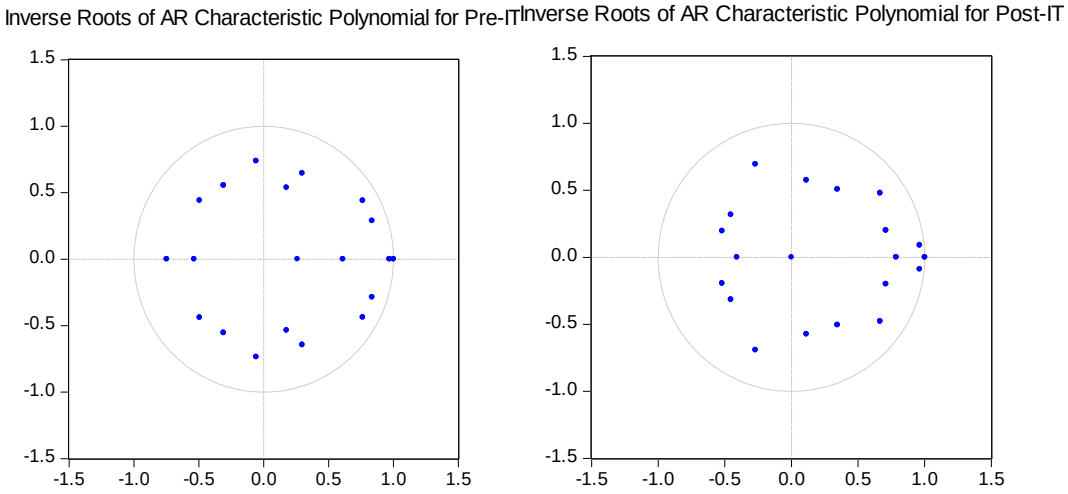

Figure 4: Stability of the VAR Estimates for pre-IT and post-IT

3.4 Results of Cointegration Test

Regression involving nonstationary variables is likely to result in spurious regression. Also, a time series integrated of order one, *I* (1), may lose interesting information. If, however, two *I* (1) variables are cointegrated, this interesting information, which includes their long term relationship can be established. This happens because these *I* (1) variables have the same stochastic trend and in the long run, they merge. That is, these variables are independently *I* (1) but there exist between them a linear combination with a cointegrating parameter that is stationary. I conduct the Johansen's cointegration test using

both the trace statistics and the maximum eigen statistics for both pre-IT and post-IT period. In Table 5, the results of the Johansen's cointegration test using trace and maximum eigen statistics in the pre-IT period indicate the presence of two cointegrating equations (r = 2) among the variables. Similarly, the results suggest the presence of four cointegrating equations (r = 4) among the variables in the post-IT period. The study therefore adopts two cointegration relationships for pre-IT and four cointegration relationships for post-IT. This result suggests that there exists a long run equilibrium relationship among the variables.

Table 5: Cointegration Test (Trace and Maximum eigenvalue)

PRE-IT				POST-IT			
Hypothesized No. of CE(s)	Eigen values	Trace Statistic	Max-Eigen Statistic	Hypothesized No. of CE(s)	Eigen values	Trace Statistic	Max-Eigen Statistic
None *	0.644	145.130	80.47822	None *	0.307	133.6195	47.618
At most 1 *	0.371	64.652	36.13908	At most 1 *	0.263	86.00176	39.733
At most 2	0.236	28.513	20.95044	At most 2 *	0.197	46.26848	28.568
At most 3	0.091	7.563	7.480282	At most 3 *	0.110	17.70068	15.126
At most 4	0.001	0.082	0.082298	At most 4	0.020	2.575176	2.575

Table 5: results of Johansen's Cointegration Test Using Trace Statistics

3.5 Short Run Dynamics (Vector Error Correction Model)

Table 6 below presents findings of the short run vector error correction model of the variables. The error correction term is the speed of adjustment and it measures the speed at which the dependent variable returns to equilibrium after a change in the last period's deviation from the long run equilibrium. The greater the value of the error correction term,

the faster the rate of convergence to the long run equilibrium. It is expected to be negative and statistically significant. The negative sign denotes the correction in the long run. Given that the model is stationary, I estimate it with the ordinary least squares. The table presents all four lags for exchange rate and cost of credit, and only the first lag of the other domestic variables and the external variables. Models designated as (1) represent equations in the pre-IT period and those designated as (2) indicate equations in the post-IT period.

Table 6: Results of Error-Correction Model (VECM) for the Variables

	EXCH RATE (1)	EXCH RATE (2)	COC (1)	COC (2)
ECT	-0.630***	-0.154***	-0.217**	-0.241***
	(0.075)	(0.044)	(0.087)	(0.052)
D (EXCH RATE (-1))	0.170	-0.123	1.656	-1.181
	(0.106)	(0.102)	(11.550)	(1.900)
D (EXCH RATE (-2))	-0.194*	0.218**	-0.280	0.272
	(0.102)	(0.103)	(11.047)	(1.925)
D (EXCH RATE (-3))	0.005	0.022	-10.077	-5.161**
	(0.115)	(0.106)	(12.517)	(1.970)
D (EXCH RATE (-4))	-0.189*	0.083	-12.274	5.042**
	(0.110)	(0.110)	(11.917)	(2.057)
D (COC (-1))	-0.005***	0.004	-0.067	0.165*
	(0.001)	(0.005)	(0.142)	(0.097)
D (COC (-2))	-0.005***	-0.004	0.113	0.137
	(0.001)	(0.005)	(0.154)	(0.092)
D (COC (-3))	-0.001	-0.006	0.287*	0.072
	(0.002)	(0.005)	(0.160)	(0.093)
D (COC (-4))	-0.001	-0.000	-0.064	0.050
	(0.002)	(0.005)	(0.165)	(0.089)
D (CPI (-1))	0.022	0.147	-4.490	-8.324
	(0.103)	(0.356)	(11.209)	(6.635)
D (MS (-1))	0.022	-0.176	5.385	-1.094
	(0.055)	(0.356)	(5.961)	(2.628)
D (PSC (-1))	0.027	0.133	-8.652	-2.057
	(0.068)	(0.148)	(7.326)	(2.757)
D (US_EURO)	-0.377***	-0.163***	10.622*	1.362
	(0.052)	(0.060)	(5.658)	(1.124)
D (US CPI)	-0.060	1.687**	-51.246***	-17.197
	(0.174)	(0.726)	(18.903)	(13.534)
D (US TIR)	0.011***	-0.004	-0.038	-0.169
	(0.003)	(0.012)	(0.266)	(0.223)

Table 6: results of error correction model (VECM) of the variables. ***, ** and * indicates 1%, 5% and 10%, respectively. The standard errors are in parenthesis. (1) and (2) are the pre-IT and post-IT period, respectively.

In Table 6, I report findings of the exchange rate equation for the pre-IT and post-IT period. The error correction term for both periods is negative and significant at 5%. This indicates cointegration among the variables. The absolute coefficient of the error correction term is 0.63 and 0.15 which signifies that the speed of adjustment is 63 percent and 15 percent for pre-IT and post-IT, respectively. The intuition is that, in the pre-IT period, the disequilibrium from the long term growth rate in exchange rate is corrected by 63 percent in the following period, and in the post-IT, this correction is only 15 percent. The speed of adjustment is therefore faster in the pre-IT period than the post-IT period.

The next variable of interest in the exchange rate equation is the exchange rate for both periods under consideration. In the pre-IT period, the exchange rate depreciates by 0.194 percent at lag 2 and by 0.189 percent at lag 4. There is, thus, reduction in the rate of depreciation at lag 4. However, in the post-IT period, the exchange rate significantly appreciates by 0.218 percent. This implies that nominal effective exchange rate has appreciated after the adoption of the inflation targeting framework. The result is consistent with the purchasing power theory and the expectation analyzed above. Rose (2007) and Prasertnukul et. al (2010) also found that exchange rate variability declines in inflation targeting countries. Measuring the impact of the external variables on the exchange rate, the study finds that the US dollar to the euro exchange rate significantly reduces the value of the local currency by 0.38 percent in the pre-IT period and 0.163 percent in the post-IT period. This implies that the external shock from the US dollar to the euro exchange rate reduces after the imposition of the inflation targeting. Also, the US CPI has no impact on the exchange rate in the pre-IT period but appreciates the exchange rate by 1.62 percent in

the post-IT period. Lastly, the US treasury interest rate appreciates the local currency by 0.01 percent in the pre-IT period but no impact in the post-IT period.

The table also presents the findings of the cost of credit equation. The error correction term is negative and statistically significant for both periods. The coefficients for the pre-IT and the post-IT periods are -0.2167 and -0.2410, indicating that the speed of adjustment is 22 percent and 24 percent, respectively. The intuition is that the disequilibrium from the long term growth rate in cost of credit is corrected by 22 percent in the pre-IT and 25 percent in the post-IT in the following period.

The next variable of interest in the cost of credit equation is the cost of credit. In the pre-IT period, the lag 3 of cost of credit is 0.2866 and significant at 10%. This implies that cost of credit increased by 0.29 percent in the pre-IT period. In the post-IT period, the cost of credit at lag 1 is 0.1651 and significant at 10%. The result implies that the cost of credit has increased by 0.165 percent after the imposition of the policy. The rate of increase in the post-IT period is less than in the pre-IT period. The result conflicts with expectation, however, the fact that the increase is less in the post-IT period is encouraging. Incorporating external shock in the pre-IT period, the result shows that the nominal exchange rate of the US dollar to the euro significantly increases the cost of credit by 10.6 percent at 1% alpha level and the US CPI lowers the cost of credit by -51.25 percent. However, in the post-IT period, none of the external variables has an impact on the cost of credit.

3.5.1 Stability of the VECM model

I conduct a stability test on the VECM model for pre-IT and post-IT periods. From Figure 2, the condition for stability is met because the moduli for the eigenvalues are strictly less than unity.

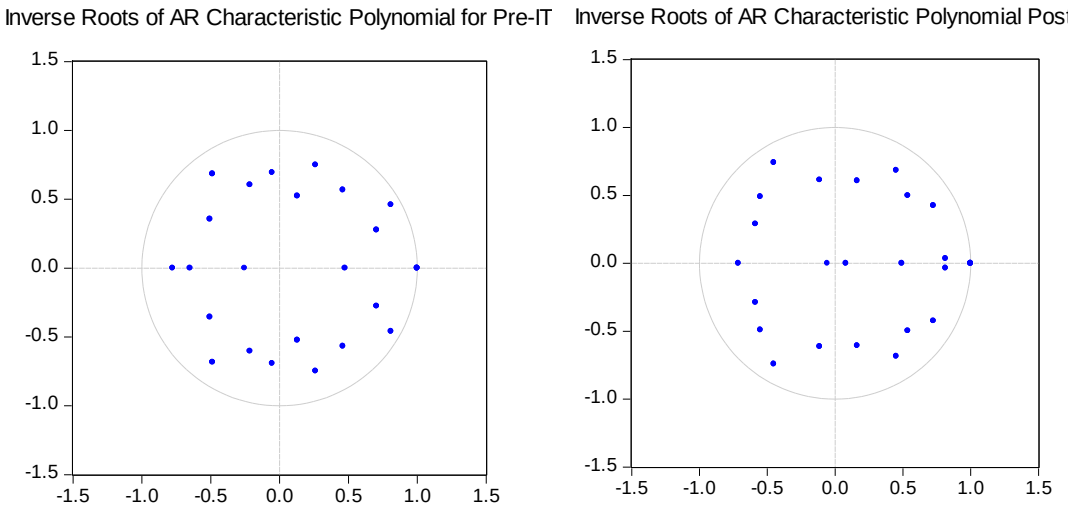

Figure 5: Stability of the VECM Estimates for pre-IT and post-IT

4.0 CONCLUSIONS AND RECOMMENDATIONS

The fundamental issue discussed in this thesis is the effectiveness of Ghana's inflation targeting policy on the exchange rate and cost of credit. To address the issue, I split the data into the period before (2001 - 2007) and after the policy (2008 - 2019). Also, I use net effective exchange rate and average commercial banks' lending rate to proxy for the exchange rate and cost of credit, respectively. I also incorporate in my model other domestic and external macroeconomic variables. The domestic macroeconomic variables are money supply, private sector credit, CPI and the external macroeconomic variables are US dollar to euro exchange rate, US CPI, and US federal bond. I obtain the variables from

the Bank of Ghana, the International Monetary Fund and the Federal Reserve Bank of St. Louis. In this study, I conduct the Mann-Whitney test to determine the significance of the difference in the means of the variables before and after the imposition of the policy. Also, the study conducts the unit root test, lag order selection criteria test, and cointegration test to determine the model to adopt. The unit root test suggests that all the variables are integrated of order one *I* (1), the lag order selection criteria test finds the optimal lag at 4 for both periods, and the cointegration test suggests 2 (r=2) cointegration relationships for the pre-IT period and 4 (r=4) cointegration relationships for the post-IT period. These results recommend the use of VECM for the analysis of short run dynamics. I also estimate the VAR to analyze the long run dynamics.

In the short run, the exchange rate depreciates in the pre-IT period but appreciates in the post-IT period. In the long run, however, the exchange rate appreciates for a while and later depreciates in the pre-IT period. In the post-IT period, the exchange rate appreciates but at the second lag, the magnitude of appreciation reduces. The effect of external shocks on the exchange rate in the pre-IT period seem to be more than the exchange rate in the post-IT period.

Further, the cost of credit increases in both periods in the short run, but the increase is large in the pre-IT period. In the long run, the cost of credit increases in both the pre-IT period and the post-IT, but the increase is larger in the post-IT. In the subsequent lags, the cost of credit reduces to the negative in both the pre-IT and post-IT period, but this reduction is only significant in the pre-IT period. Finally, the result also indicates that the external shock negatively affects both the exchange rate and cost of credit in the pre-IT, however, there is no effect on the variables in the post-IT period.

The findings from this thesis imply that the central must put in place mechanisms to increase its credibility. That is, the inability for the cost of credit to decline in the long run is an indictment on the policy credibility. Credibility is necessary to keep the inflation expectation of the public anchored in the inflation target. The resultant effect is a lower inflation rate and interest rate. This will further reduce the cost of credit and appreciate the local currency.

The result further implies that the fees and interest rate charged on loans must be regulated. There should be a mechanical way to ascertain the interest charged on loans to avoid extortion by the commercial banks.

Lastly, government must be fiscal discipline to avoid increasing cost of credit. Effective monetary policy is accompanied with fiscal disciplined. If government must embark on large scale domestic borrowing to finance deficit, interest rate rises and crowds out the private sector.

REFERENCES

Abradu-Otoo, P., Amoah, B., & Bawumia, M. (2003). An investigation of the transmission mechanisms of monetary policy in Ghana: A structural vector error correction analysis. *Bank of Ghana, Working Paper*, *2*.

Adu, G., Karimu, A., & Mensah, J. T. (2015). An empirical analysis of exchange rate dynamics and pass-through effects on domestic prices in Ghana. *International growth centre working paper*.

Asafo, S. S. (2019). Exchange Rate Pass-through to Prices: Bayesian VAR Evidence for Ghana.

Ball, L. M., & Sheridan, N. (2004). Does inflation targeting matter? In *The inflation-targeting debate* (pp. 249-282). University of Chicago Press. Ball, L. (2000). *Policy rules and external shocks* (No. w7910). National Bureau of Economic Research.

Bank of Ghana (2009b). *External Sector Developments: Monetary Policy Report 4*. Accra, Ghana: BoG.

Bawumia, M., Amoah, B., & Mumuni, Z. (2008). *Choice of monetary policy regime in Ghana*. Bank of Ghana Working Paper (Vol. WP/BOG-200).

Bernanke, B.S., Laubach, T., Mishkin, F.S. and Posen, A.S. (1999). *Inflation targeting: Lessons from the international experience*. Princeton, NJ: Princeton University Press.

Bénassy-Quéré, A., Coeuré, B., & Jacquet, P. (2010). *Economic policy: theory and practice*. Oxford University Press, USA.

Carare, M. A., Schaechter, A., Stone, M. R., & Zelmer, M. (2002). *Establishing initial conditions in support of inflation targeting*. International Monetary Fund.

Dornbusch, R. (1976). Expectations and exchange rate dynamics. *Journal of political Economy*, *84*(6), 1161-1176.

Dornbusch, R. (1985). *Purchasing power parity* (No. w1591). National Bureau of Economic Research.

Edwards, S. (2006). *The relationship between exchange rates and inflation targeting revisited* (No. w12163). National Bureau of Economic Research.

Fosu, N. K. (2015). *Inflation Targeting: The Ghanaian Experience* (MPHIL thesis, University of Ghana).

Freeman, R. T., & Willis, J. L. (1995). *Targeting inflation in the 1990s: recent challenges* (No. 525).

Ivrendi, M., & Guloglu, B. (2010). Monetary shocks, exchange rates and trade balances: Evidence from inflation targeting countries. *Economic Modelling*, *27*(5), 1144-1155.

Johansen, S. and Juselius, K. (1990), 'Maximum Likelihood Estimation and Inference on Cointegration –With Application to the Demand for Money', *Oxford Bulletin of Economics and Statistics*, 52(2): 169-211.

Kwakye, J. K. (2012). Financial intermediation and the cost of credit in Ghana.

Kydland, F., and E. Prescott. 1977. “Rules Rather than Discretion: The Inconsistency of Optimal Plans.” *Journal of Political Economy* 87, pp. 473-492.

Lanzafame, M., & Nogueira, R. (2013). Inflation targeting and interest rates.

Marques, A. C., Fuinhas, J. A., & Menegaki, A. N. (2014). Interactions between electricity generation sources and economic activity in Greece: A VECM approach. *Applied energy*, *132*, 34-46.

Maysami, R. C., Loo, S. W., & Koh, T. K. (2004). Co-movement among sectoral stock market indices and cointegration among dually listed companies. *Jurnal Pengurusan*, *23*, 33-52.

Mishkin, F. S. (2000). Inflation targeting in emerging-market countries. *American Economic Review*, *90*(2), 105-109.

Mishkin, Frederic S., and Schmidt-Hebbel, K. (2006). *“Does Inflation Targeting Make a Difference**?**”* Central Bank of Chile Working paper No. 404.

Ndikumana, L., & Heintz, J. (2010). Is There a Case for Formal Inflation Targeting in Sub-Saharan Africa? *University of Massachusetts, Political Economy Research Institute Working Paper*, (218).

Neumann, M. J., & Von Hagen, J. (2002). *Does inflation targeting matter?* (No. B 01-2002). ZEI working paper.

Ohno, K. (1989). Testing purchasing power parity and the Dornbusch overshooting model with vector autoregression. *Journal of the Japanese and International Economies*, *3*(2), 209-226.

Pétursson, Þ. G. (2004). *The effects of inflation targeting on macroeconomic performance*. Central Bank of Iceland, Economics Department.

Prasertnukul, W., Kim, D., & Kakinaka, M. (2010). Exchange rates, price levels, and inflation targeting: Evidence from Asian countries. *Japan and the World Economy*, *22*(3), 173-182.

Rose, A. K. (2007). A stable international monetary system emerges: Inflation targeting is Bretton Woods, reversed. *Journal of International Money and Finance, 26*(5), 663-681.

Sanusi, Aliyu Rafindadi (2010). Lessons from the foreign exchange market reforms in Ghana: 1983-2006. *Journal of Economics and Allied Fields*, Vol. IV, No. 2.

Schmidt-Hebbel, K., & Tapia, M. (2002). *Monetary policy implementation and results in twenty inflation-targeting countries* (Vol. 166). Banco Central de Chile.

Schaechter, A., Stone, M. R., & Zelmer, M. (2000). *Adopting inflation targeting: Practical issues for emerging market countries* (Vol. 202). Washington, DC: International monetary fund.