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Financial Crowding Out of Ghanaian Private Sector Corporations

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This is to certify that the doctoral dissertation by

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Abstract

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MBA, University of Ghana, 1999

MSc, IHE Delft, 1994

BSc, Kwame Nkrumah University of Science and Technology, 1986

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The government of Ghana borrows from both domestic and foreign sources to finance the budget deficit. By the year 2013, the domestic debt was 55% of the public debt. Government domestic borrowing is competitive and can potentially crowd out the private corporate sector. Therefore, the specific research problem addressed in this study was whether the Ghanaian government's domestic debt (DEBT) caused financial crowding out (FCO) in Ghana. FCO theory is not conclusive and not proven specifically for Ghana, so the purpose of this research was to investigate its presence in Ghana. The neoclassical theory of FCO underpinned the research. The 2 research questions investigated FCO along the quantity and cost channels. The research examined the relationship between DEBT as the independent variable, the quantity of private sector credit (PSCREDIT), and the net interest margin (NIM) of banks as dependent variables. Covariates were macroeconomic and banking industry variables. The research population was the banking sector of the financial services industry. The research was correlational, and it used time series data from the Bank of Ghana and the World Bank. Data analysis used the autoregressive distributed lag method. The analysis returned a negative relationship between DEBT and PSCREDIT, and a positve relationship between NIM and DEBT. These results indicated the presence of FCO along both the quantity and cost channels. The research provides policymakers a means of quantifying the extent and effects of fiscal policies. The study may contribute to positive social change by promoting the revision of fiscal policies to favor the private corporate sector to invest, create jobs, and grow the Ghanaian economy.

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Dedication

I dedicate this work to my family-- my wife Mama Darkoa and daughters Maajoa and Afiba; my mum who passed just as I started this journey and my dad; and all the Tesano family. Thank you all for your support that made this happen.

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Writing this dissertation has been a challenging experience for me, and I am grateful to God for the lessons learned along the way. I am also grateful to the host of people who supported me along the way. First, I would like to thank my business partner, Mr. K. D. Boateng, for his support. My participation in company work was minimal to non-existent during the period I was researching and writing, and he filled in the gap remarkably without any complaints. I would like to acknowledge the contributions of Dr. Mohammed Sani Abdulai, an alumnus, who introduced me to Walden and encouraged me to stay the course; Mr. Joseph Torku who facilitated my interaction with the Ghanaian finance community; and Dr. F. Etu-Menson who encouraged me to challenge conventional wisdom. I would also like to acknowledge the support of various officers of the Bank of Ghana and the Ghana Ministry of Finance who supported me in different ways along the way. Finally, I want to thank my committee for their invaluable assistance and supervisory work. The contribution of my chairperson, Dr. Mohammad Sharifzadeh, committee member Dr. Steven Tippins, and URR, Dr. Tom Butkiewicz has been unparalleled. Their attention to detail ensured that the final product is the best there could be.

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Chapter 1: Introduction to the Study

Accessing credit to finance businesses in Ghana is an ongoing challenge (Haselip, Desgain, & Mackenzie, 2014; Musa & Acheampong, 2015; Sarbah & Wen, 2013). A World Bank (2014) study in Ghana found that, in 2013, banks financed only 12.6% and 26.8% private sector corporations' (PSCs) investment and working capitals respectively. The government of Ghana (GoG) also borrows extensively from the domestic market and, by the year 2013, 55% of the public debt was from domestic sources (Ministry of Finance, 2015). In this quantitative research, therefore, I hypothesized and investigated the presence of financial crowding out (FCO) in Ghana as defined by Graham, Leary, and Roberts (2014).

The dissertation is in five chapters. In this first chapter, I provided a background to the study and stated the problem, the purpose, the hypotheses, and research questions. I also discuss the significance of the study and its implications for social change. In Chapter 2, I present a review of the literature on FCO and a preliminary examination of the methods for assessing FCO an economy. In Chapter 3, I present the design of the research and discuss my data collection and analysis methods. In Chapter 4, I discuss my data collection, analysis, and hypothesis testing. I conclude with Chapter 5, in which I discuss my findings and their contribution to positive social change; I also conclude and make recommendations for future research.

Background of the Study

Several factors determine how firms gain access to credit for their operations in a country. Researchers including Gimet and Lagoarde-Segot, (2012), Joeveer (2013), and Love and Peria (2015) identified these factors and noted that they operate

at the levels of the economy, firm, household, and lending institutions or banks. At the national level, the determinants are market and macroeconomic factors. The macroeconomic factors result from government policies that affect inflation, the gross domestic product (GDP) and other economic indicators. Firm-level access to credit results from the size of the firm and corporate policies on the capital structure of the corporation. I discuss these factors in detail in the following sections.

Market Factors

The effect of market factors on access to credit refers to competition among the financial service providers in the country. Competition in the banking sector has a direct relationship with access to credit (Beck, Demirguc-Kunt, & Singer, 2013; Gimet & Lagoarde-Segot, 2012; Love & Peria, 2015). When a few large banks dominate the industry, no degree of competition in the sector is likely to exist. Love and Peria (2015) confirmed that the resulting low competition reduces firms' access to finance.

Macroeconomic Factors

The two major policies that emanate from the macroeconomic conditions in a country are the monetary and the fiscal policies. Monetary policy relates to the supply and management of money in the economy, whereas fiscal policy refers to the management of the government's budget. Gimet and Lagoarde-Segot (2012) intimated that governments' macroeconomic policies affect access to finance because of the effect of such policies on inflation, the size of the economy, savings rate, government borrowing, treasury bill rates, and exchange rates.

Fiscal policy emerges as a deficit management strategy. Kugbee and Insah (2015) noted that the policy options available to governments are bailouts from

international financial organizations such as the International Monetary Fund (IMF) and the World Bank, defaulting on debts, borrowing from internal and external sources, or issuing debt against securities to the central bank. Other policy options for managing budget deficits include cutting public spending, boosting the revenue base through increased taxation, or implementing measures that will promote economic growth.

Researchers differ in their opinions regarding the role of fiscal policy on FCO. Mallick (2013) explained the position of theorists concerning deficit financing. According to Mallick, the Ricardian theorists suggest deficit financing will not affect the supply of credit whereas the Keynesian theorists argue that the policy will crowd-in credit. The neoclassical theorists, on the other hand, contend that such policies would stifle economic development by crowding out private sector credit. Ghana's experience seems to reflect the neoclassical viewpoint because Adom and Williams (2012) found that increased taxation drove some Ghanaian firms into the informal sector to avoid paying taxes, effectively rendering such a policy counterproductive.

Firm-Specific Factors in Access to Credit

Firm-level characteristics that affect access to credit include the size, asset tangibility, and leverage for listed companies (Joeveer, 2013); financial distress (Myers & Majluf, 1984); or the presence of low deficits (Bhaduri, 2015). The financing policy of the company is another characteristic that may determine their use of credit. According to the pecking order theory (Myers & Majluf, 1984), a firm might adopt a financing model based on a hierarchized source of funding comprising retained earnings, debt, and equity. Firms may also prefer equity because of asymmetric information or existing debt (Fulghieri, Garcia, & Hackbarth, 2013).

Household-Specific Factors in Access to Credit

Households and individuals supply funds to banks in the form of deposits that become loans to borrowers. Thus, a direct relationship exists between deposits and the volume of loans that banks can make. Per the liquidity preference theory (Keynes, 1936) and the quantitative theory of credit, (Werner, 2012) deposits will increase with increasing savings interest rate. These theories notwithstanding, Hanson, Shleifer, Stein, and Vishny (2015) concluded that households might be motivated to deposit their funds with banks for safety, ease of access, and the assurance of prudent investment. Households may also divert their funds from the banks due to consumption needs, instability in the banking system, or the existence of alternative forms of investment including government bonds and treasury bills.

Bank-Specific Factors in Access to Credit

Lending policy. Standards and policies set by the lending institutions do not qualify every firm for credit. The requirements for collateral or other forms of security can be a barrier to accessing credit from banks as noted by Akudugu (2012), Musa and Acheampong (2015), and Sarbah and Wen (2013). Asogwa and Okeke (2013) study of the Nigerian financial market revealed that a policy of lending to the government was one of the contributory factors to the lack of credit to the private sector. Such a policy may be a risk management strategy, but it could be a setback for firms intending to borrow. Other policies, such as investment in high-interest treasury bills (Fayed, 2013) and other low-risk securities by banks, can be responsible for financially crowding out the private sector.

Reserves. Werner (2012) noted in the quantitative theory of credit that the central bank and commercial banks create money by making loans. Central banks

require banks to reserve a percentage (R) of deposits. They can then extend credit to households and firms up to 100-R the reserve amount. However, banks can make loans by increasing their reserves without receiving money from depositors. Commercial bank reserves held by the central bank can determine the volume of credit available in an economy.

Gap in Theory

Given the above arguments, several factors influence firms' access to credit including FCO. The FCO theory is, however, still evolving as evidenced by Aisen and Hauner (2013), who stated that substantial amounts of literature support every opinion on the subject. For example, Sharpe (2013) posited that crowding out occurred only in nonsovereign countries, whereas Gjini, Durres, and Kukeli (2012) doubted the theory and argued that it may exist in the West but not in Eastern Europe. In emerging economies, Fayed (2013) found crowding in in the long term in Egypt but noted that high treasury bill rates could trigger crowding out. Asogwa and Okeke (2013), on the other hand, found FCO in Nigeria but also noted that it has a Granger causality relationship with budget deficits.

Sheriff and Amoako (2014) indicated a short-term relationship between interest rate spread (IRS) and government debt in Ghana. However, Ho and Saunders (1981) had argued that the IRS does not represent the full cost of financial intermediation. Other variables, such as fees and commissions, operational costs, and industry characteristics, add up to the cost of credit. The authors, therefore, proposed the use of the net interest margin (NIM) as an accurate reflection of the cost of financial intermediation. Also, my definition of FCO refers to both the cost and the quantity of credit, a definition that Sheriff and Amoako (2014) did not consider in

their study. Therefore, in my research, I extended their work by replacing the IRS with the NIM. I also included additional variables in the model to yield a better picture of the extent of FCO in the Ghanaian economy. Following Djankov, McLiesh, and Shleifer (2007), I used the GDP as a deflator to make the results comparable with results from other countries and, hopefully, to contribute toward convergence of the theory.

Problem Statement

The GoG borrows from domestic and foreign sources to finance the budget deficit. In 2013, 55% of the public debt in Ghana was from domestic sources (Ministry of Finance, 2015). The government's domestic borrowing is competitive and has potential crowding out effect on PSCs. FCO theory is not conclusive (Aisen & Hauner, 2013) and is not proven specifically for Ghana. Therefore, the specific research problem that I addressed in this study was whether government's domestic debt caused FCO in Ghana. I correlated private sector credit with the government's domestic debt to investigate FCO along the quantity channel (Djankov et al., 2007; Fayed, 2013). I also correlated the NIM of banks with government's domestic debt to investigate FCO along the cost channel. I sourced data from the Bank of Ghana (BoG) and the World Bank. My findings showed that FCO existed in Ghana. Results contribute to positive social change by supporting a re-evaluation and a revision of Ghana's fiscal policies to favor the private corporate sector.

Purpose of the Study

The purpose of this quantitative research was to investigate the presence of FCO in Ghana. My investigation was along the quantity and cost channels. I correlated government debt, my independent variable, with the quantity of private

sector credit, my independent variable, along the quantity channel in the first instance. In the second model, I correlated government debt as an independent variable, with the cost of credit represented by the NIM as the independent variable along the cost channel. My data were time series from the Bank of Ghana and the World Bank databases. The results indicated the presence of FCO in Ghana along both channels and provided practitioners a means to quantify the extent and effect of government fiscal policies on the private corporate sector.

Research Questions and Hypotheses

I investigated the phenomenon of FCO in Ghana that is, whether the government's domestic debt competed with credit to the private corporate sector. I asked two questions along the quantity and cost channels respectively to form the basis of my research. The first question and the associated hypothesis were:

RQ_1: What was the relationship between government's domestic debt and the volume of private sector credit?

The hypotheses I tested for the first research question were:

H_{01}: There was no significant relationship between government's domestic debt and the volume of private sector credit.

H_{a1}: There was a significant relationship between government's domestic debt and the volume of private sector credit.

In testing the first hypothesis, I used multiple regression data analysis processes to correlate volume of private sector credit with the government's domestic debt and other macroeconomic covariates. The dependent variable was the volume of private sector credit. The independent variable was the government's domestic debt comprising loans to central government and its agencies, treasury bill, and bond

purchases by banks. Covariates were macroeconomic variables comprising the GDP, the treasury bill rate, and the level of financial intermediation.

The second research question and associated hypotheses were:

RQ_2: What was the relationship between government's domestic debt and the cost of credit to the private sector in Ghana?

The hypotheses I tested for the second research question were:

H_{02}: There was no significant relationship between government's domestic debt and the cost of credit to the private sector

H_{a2}: There was a significant relationship between government's domestic debt and the cost of credit to Ghanaian private sector corporations.

For the second hypothesis, I used multiple regression analytic processes to correlate the dependent variable, the NIM, with the independent variable, the government's domestic debt. Covariates were a vector of macroeconomic variables for the country, a vector of bank operational variables, and a vector of industry variables.

Theoretical Foundation

Three schools of economic thought or theories define and describe the FCO phenomenon. These are the Ricardian equivalence theory, the Keynesian theory, and the neoclassical theory. Each theory reflects a unique position regarding FCO.

Barro (1989) expounding the Ricardian equivalence theory, argued a null effect of deficits on interest rates. Barro explained that rational households increase their savings in anticipation of higher taxes in the presence of deficits. Savings improve the cash holding of banks, thus reducing the need to increase interest rates to attract deposits. Many researchers have attempted to refute the theory. Schlicht

(2013), for example, stated that its premise, the rational behavior expectation of households, invalidated it because it omitted interest payments on the public debt. The author averred that extracting interest payment on government debt from households will reduce the volume of their savings and affect the cost of credit. Caparole (2015) also argued against the Ricardian equivalence theory. Caparole's research of the effect of taxation on interest rates found a significant negative relationship between the two, which led the researcher to conclude that the Ricardian theory is inconsistent with the theory of FCO.

Mahmoudzadeh, Sadeghi, and Sadeghi (2013) elucidated the Keynesian approach to FCO that government spending complements credit supply. Deficits, according to the authors, signal positive economic conditions to the private corporate sector, which responds with higher investments in the economy. Therefore, applying the Keynesian theory should result in a crowd-in in credit demand and investments in the economy. However, when Balcerzak and Rogalska (2014) analyzed data from different countries using the Keynesian investment-savings, liquidity-money (IS-LM) framework, they concluded that the theory did not yield consistent results. Econometric factors relevant to specific countries led to different outcomes. They also found contradicting results from the same country when they applied other methods or used different data periods, leading them to conclude that the Keynesian theory is not a reliable tool for research into FCO.

The neoclassical theory evolved from the classical theory espoused by Adam Smith according to Lawson (2013). In classical theory, the distribution of the production of an economy is proportional to the cost incurred by different strata of society to produce it. Hence, the price of a product will reflect the cost of production.

Researchers, however, quickly noted that people are willing to pay more than the production cost to acquire a product leading to the formulation of the neoclassical theory. Neoclassicists use their theory to explain the notion of value, that is, the relationship between an object and its acquirer, that led to the formulation of relations between demand, supply, and price. Weintraub (2002) stated that neoclassical theory dominated economic discussions. Researchers use the theory to spawn new theories rooted in its basic assumptions. Thus, there is a neoclassical theory of FCO, which was my choice of theory for this study.

The neoclassical theory of FCO, as discussed by Claeys, Moreno, and Surinach (2012), posits that increases in budget deficits have a direct correlation with interest rates. The rationale behind this theory is that government borrows to finance its budget deficit. The demand for credit by the government will consequently exert upward pressure on interest rates. Higher interest rates increase the probability of bankruptcy for borrowing firms, and thus they will refrain from issuing debt; that is, they will be crowded out. The neoclassical theory, therefore, is an appropriate analytical theory for explaining the phenomenon of FCO in an economy. I am, therefore, adopting the neoclassical theory for my research.

Nature of the Study

The two major strands of research are the qualitative and quantitative methods. Qualitative researchers explore the thoughts, actions, and speeches of persons to arrive at context specific conclusions (Kaczynski, Salmona, & Smith, 2014). Findings are not generalizable to whole populations. Quantitative research, on the other hand, allows the use of large datasets, hypothesis testing, and deductive reasoning to arrive

at replicable conclusions. The choice of method is, therefore, a function of the nature of the data and the objective of the research.

The objective of my research was to investigate the presence of FCO in Ghana. The research replicates similar studies and is an attempt to generalize their findings to Ghana. I adopted a quantitative approach because my objectives, data, analytical method, and application were amenable to that approach. I used the method of Johnson (2001) to classify my research as correlational and explanatory.

Study Variables

Cost of credit model. Following the steps of Ho and Saunders (1981) and Mensah and Abor (2014), I adopted the NIM to represent the cost of credit. The independent variable for estimating the cost of credit was the government's domestic debt. Covariates were macroeconomic, banking, and industry variables.

Quantity of credit model. I followed in the steps of previous researchers including Djankov et al., (2007) and Fayed (2013) and used the quantity of credit to the private corporate sector as my dependent variable. My independent variable was the government's domestic debt. Macroeconomic variables constituted my covariates.

Data sources. I limited the research population to the Ghanaian financial sector operators who report to the Bank of Ghana as was reported in the 2016 Annual Report of the BoG (Bank of Ghana, 2017). I sourced my data from the BoG and the World Bank's Database.

Data Analysis Process

Following the steps of Agca and Celasun (2012) and Fayed (2013), I adopted multivariate regression analysis processes to study the correlation respectively

between (a) the quantity of private sector credit, and (b) the cost, and government's domestic debt and other covariates.

I used a regression model of the form $Y_t = \beta_0 + \beta_1 X + \varepsilon_t$, where Y_t is the dependent variable, β_0 and β_1 are regression constants, X_t is the independent variable, and ε_t is the error term. My independent variable is the government's domestic debt represented by X_t in the model. In the presence of crowding out, the constant $\beta_1 < 0$ for the quantity model and $\beta_1 > 0$ for the cost model. If the error term, ε_t, is random, the constant β_1 will be an unbiased, consistent, and efficient estimator of FCO in both the short and long term. If the dependent variable correlated with both the current and lagged values of X_t, a distributed-lag model will result, and the relation between the variables will be of the form: $Y_t = \beta_0 + \beta_1 X_t + \beta_2 X_{t-1} + \beta_2 X_{t-2} + \ldots + \beta_n X_{t-n} + \varepsilon_t$. Under these circumstances, there is both a short-run and long-run relationship between the variables. The short-run relation shall be β_1 whereas the long-term relationship will be of the form $\Sigma^{n}_{t=1}\beta_t = \beta_1 + \beta_2 + \beta_3 + ..+ \beta_n$. The two estimators were the key results I relied on to answer the research questions.

My data analysis tools were visual, the IBM's Statistical Package for the Social Sciences (SPSS) software (IBM, 2015), also known simply as SPSS. I also used Microsoft Excel, and the Eviews software, to perform analyses not available through the SPSS. I used visual inspection of my data to find duplicates, missing data, and mistakes. I replaced randomly missing data by interpolation. I used correlation methods to check the collinearity relation among my research variables and removed one of any pair of variables that had a correlation coefficient greater than 0.9. I used the augmented Dickey-Fuller method (ADF) to check the unit root properties of my variables and the bounds test method to check for the existence of a level relationship

between the independent and dependent variables. I performed my regression analysis using the autoregressive distributed lag (ARDL) method. The ARDL cointegration method yielded my long- and short-term regression models. Finally, I checked the construct validity of my model using the Ramsey stability analysis method. I tested my hypotheses by examining the magnitude and sign of the regression coefficient of the government's domestic debt and the other macroeconomic covariates.

Definitions

Access to finance: Access to credit (with or without a formal loan), deposit (with/without commercial, rural bank, other banks), insurance. Sourced from Brazil: Access to Financial Services, World Bank Report No. 27773-BR (2004).

Annual budget deficit (*D*): The annual budget deficit of the government measured as a percentage of GDP. The data were made available by the Bank of Ghana.

Annual inflation (*I*): Inflation as measured by the consumer price index (CPI). The model used average annual rate of inflation expressed as a percentage. Data were made available by the Bank of Ghana.

Bank concentration (*C*)*:* The variable measures the assets of the three largest banks as a share of the assets of all commercial banks in the country expressed in a percentage.

Bank efficiency (*E*): E is the ratio of overhead costs to total assets, defined as the accounting value of a bank's overhead costs as a share of its total assets.

Bank risks (R_b): R_b is the proportion of all outstanding loans-to-total assets measured at the end of the year.

Bank size (*S*): S is the total assets of commercial banks relative to the GDP.

Exchange rate (*R*)*:* R is the official exchange rate calculated as an annual average based on monthly averages of local currency units relative to the U.S. dollar.

Government domestic debt (*DEBT*): DEBT is the entire stock of direct government fixed-term contractual obligations to others outstanding on a particular date. It includes loans, treasury bill purchases, and bonds issued to banks. Banks measure debt on the last day of the reporting period.

Gross domestic product (*GDP*)*:* GDP at purchaser's prices is the sum of the gross value added by all resident producers in the economy plus any product taxes minus any subsidies not included in the value of the products.

Herfindahl-Hirschman index (*HHI*): The HHI measures competition in an industry. Lijesen, Niljkamp, and Rietveld (2002) defined HHI as the sum of squared market shares of all firms in the market.

Institutional quality (*INSQUAL*): The institutional or regulatory quality captures the perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution (i.e., ranging from approximately -2.5 to 2.5). Kaufmann, Kraay, and Mastruzzi (2010) derived the definition and estimate.

The level of financial intermediation (*FINT*): The ratio of total deposits, comprising time and savings, to the monetary base (M2) in the economy. Rother (2001) provided the definition.

Money supply or monetary base (*M2*): Money and quasi-money comprise the sum of currency outside banks, demand deposits other than those of the central

government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.

Net interest margin (NIM): The NIM is the accounting value of net income as a ratio of total bank assets (Ho & Saunders, 1981). I estimated the variable from data made available by the Bank of Ghana.

Private sector credit (*PSCREDIT*): PSCREDIT refers to financial resources provided to the private sector by deposit-taking companies (i.e., banks, except the central bank). Financial resources include loans, purchases of non-equity securities, trade credits, and other accounts receivable that establish a claim for repayment.

Public-private partnership (*PPP*): Contractual agreement between a public entity and a private sector organization with the objective of providing infrastructure and services usually provided by the public sector.

Pure spread (α_0): The pure spread is the bank's margin due to transactions uncertainty (Ho & Saunders, 1981). The variable was the regression intercept in the model.

Treasury bill (*TBRATE*): A Treasury bill is a short-term investment product issued for a specific time duration of either 91, 180, or 365 days and offered by the Bank of Ghana on behalf of the government. The TBRATE used in the research was the 91-day rate averaged monthly and provided by the BoG.

Small- and medium-sized enterprises (*SMEs*): Firms that employ fewer than 140 persons (Aryeetey, 1994).

Special purpose vehicles (SPVs): Companies set up to execute a single project under a PPP contract.

Assumptions

I made three assumptions in undertaking my research. Musgrave (1981) distinguished between three types of assumptions: negligible, with minimal impact on the theory; domain, which describe applicable conditions; and heuristic, which simplify the logical development of the theory. Mulgrave stated that an assumption may start out as negligible but can progress to domain and heuristic after subjection to extensive evaluation and analysis of its effect on the theory. In performing my research, I made certain assumptions situated within the domain assumptions framework.

My first assumption was about the choice of theory. The three schools of economic thought argue different positions on the theory of FCO. The neoclassical school support crowding out, the Keynesian school argued crowding in, and the Ricardian school argues a no consequence relation (Mallick, 2013). One of these theories must operate in the country, and I assumed that the neoclassical theory applied to Ghana given the country's status as a lower-middle-income economy with frequent episodes of IMF interventions.

My second assumption was about my research data. I used data from the Bank of Ghana and the World Bank. I assumed that the data they provided was accurate, unbiased, and adequate to make predictions and generalizations based on the theory.

I used time series data, which is a special case of panel data. Flannery and Hankins (2013) challenged the case of bias in panel data but also acknowledged the existence of scientific methods for treating such bias. I assumed that I could use one of the available methods to treat any symptoms of bias in my data.

Scope and Delimitations

Financial services offered by the banking industry include credit supply, deposit taking, payments, and insurance services. I focused only on the demand and supply of credit to private corporations. I adopted this research focus because of the complaint by corporate Ghana that access to finance was one of their greatest challenges (World Bank, 2014).

I limited the study to the 33 deposit money banks (DMBs) in Ghana (Bank of Ghana, 2017). They controlled 85.6% of the assets of the banking industry in the country, and their contribution to the presence or otherwise of the phenomenon of FCO could be substantial. The other financial institutions, that is, the rural and community banks (RCBs) and the nonbank financial institutions (NBFIs) also advance loans to customers but, despite their large numbers, they control only 14.6% of the total assets of the industry. The quantity of credit they advance is relatively small to be of any significance.

The GoG's borrowing was not limited to the domestic market only. The government borrowed between 1% and 5% of GDP from foreign sources to finance the deficit (Ministry of Finance, 2015). However, this source of funding did not compete with local firms for access to credit from the domestic market. Thus, I excluded foreign borrowing by the GoG from the analysis.

Limitations

In this research, I sought to correlate the quantity and the cost of credit to the private corporate sector with government debt. The sector comprised industries of various types and sizes, and with different credit ratings. I did not attempt to differentiate between the institutions. It was possible that some sectors received better

services than others. However, I overcame this limitation by aggregation, that is, the estimates were at country and not at the level of the firm. The implication was that the results I obtained addressed the issues of cost and quantity of private sector credit at the aggregate level without distinguishing between sectors of the economy.

I used data from the Bank of Ghana and World Bank. The reliability and accuracy of the data were beyond my control as a researcher. However, these are credible institutions with several years' experience in data collection, cleaning, analysis, and dissemination. The reliability of the data from these sources was a reasonable expectation.

The frequency of my data was a mixture of annual and monthly intervals. Macroeconomic variables were reported annually, whereas banking data was monthly. To assure adequate power for the research's findings, I adopted the monthly intervals and, to overcome the lack of monthly macroeconomic data, I used the annual data for each month for the reporting year.

Significance of the Study

Different levels of economic development, openness, and systems of governance characterize the countries of the world (Kaufmann et al., 2010). These systems affect the management of budget deficits and government debt. The import of the different administrative setups is that research may reveal country-specific effects of FCO.

Regionally, Ghana is in sub-Saharan Africa, one of the least developed regions of the world. The country is lower middle income and has been a beneficiary of substantial International Development Association (IDA) and IMF loans, and bilateral assistance from several countries. In addition to the external loans, the GoG also

borrows extensively from the domestic market to supplement its revenue shortfalls. Therefore, a potential for the FCO of Ghana's private corporate sector existed which motivated my research.

Significance of Theory

The specific problem that I investigated in this study was whether the government's domestic borrowing caused FCO in Ghana. I undertook this research in the knowledge that researchers remain divided on the subject of FCO. All the empirical research had yielded different results and interpretations of the phenomenon according to Hubbard (2012). The Ricardian theorists, for example, concluded that FCO did not exist, the Keynesians argued that government debt had crowding in effect, and the neoclassical theorists posited that government debt crowded out the private corporate sector.

I adopted the neoclassical position following Asogwa and Okeke (2013), who found FCO of investments in Nigeria. However, the neoclassical paradigm is not without differing points of view. For example, Sharpe (2013) argued that crowding out occurs only in non-sovereign countries because those governments cannot print their currency and could only finance their deficits through increased taxation or borrowing. Gjini et al. (2012) stated that crowding out occurs only in developed economies. They concluded that public expenditure in developing countries crowds in private investment. However, their argument referred to public investments without indicating the source of financing and therefore left a gap in the theory. My study has contributed to the rhetoric on FCO by indicating the presence of FCO in Ghana.

Significance to Practice

The GoG adopted a PPP policy (Ministry of Finance, 2011) for infrastructure development in the country. PPPs are project financed and, therefore, highly levered with debt-to-total capital ratios up to 75%. According to Esty, Chavich, and Sesia (2014), approximately one-third of such projects has debt-to-total capital ratios of 80%. Bank loans and bonds constitute 81% and 19% of these debts respectively. Ghana's PPP program can be successful if private sector firms have access to bank credit and other forms of debt. Unfortunately, the need to finance budget deficits drove the government to the financial market to raise funds. These actions made the government a competitor of the private sector in the market. Ahiawodzi and Sackey (2013) stated that Ghanaian banks preferred to invest in the low-risk government debt, thus depriving the private sector of funds for investment.

Studies in Ghana confirm the low level of use of bank credit by Ghanaian businesses. Abor (2005); Antwi, Mills, and Zhao (2012); Awunyo-Vitor and Badu (2012); and Tornyeva (2013) found that internal or firm-specific factors influenced capital decisions. Andani and Al-hassan, (2014) also found that Ghanaian firms use short-term credit, trade credit, and other nonbank sources to finance their businesses. These findings could indicate the absence, or the rationing, of credit by the banks while they invested in government debt.

The government, acting through its Ministry of Finance, is responsible for the macroeconomic policies and management of the country. Policymakers can use my results to quantify the extent and effect of government fiscal policies on the private corporate sector and to support policy revision.

Significance to Social Change

Gaye (2013) stated that a financially crowded-out private sector could result in a slowdown or stagnation in economic activities, growth, and welfare. It can also induce a financial crisis in affected countries as observed by Broner, Erce, Martin, and Ventura (2014). Other potential problems include low industrial growth and job losses (Asogwa & Okeke, 2013) and low investment in research and development in the economy (Cecchetti & Kharroubi, 2015). On the other hand, financial crowding in, where government stimulates the economy by not borrowing or by cash injection, can lead to growth and prosperity for all (Kaboski & Townsend, 2012).

FCO reduces the supply of credit to the private sector in quantity or increases the cost. When businesses cannot finance their operations, they downsize and lay off staff. Laid-off workers may move into the informal economy (Adom & Williams, 2012) and pay no taxes, remain unemployed and experience a deterioration in their quality of life, or become a burden on society. On the other hand, when businesses have access to affordable credit in their desired quantities, they are likely to expand operations, create jobs, and contribute to social programs for the benefit of their host communities.

My research findings help produce a positive social change in Ghana in several ways. My results can contribute to policy revision in deficit financing. I expect that government would borrow less so that cheaper and adequate funds will be available to the private sector for investment and other productive uses. Individual Ghanaians will have jobs, and all will pay taxes that government can use to provide social services to improve the quality of life of citizens. I also expect that my research will inspire other research on the financing of Ghanaian businesses to understand their

operational challenges. Such research may lead to the formulation of policies that would support their operations and survival.

Summary and Transition

The purpose of this quantitative research was to investigate the presence of FCO in Ghana by examining the relationship between government domestic debt and credit advanced to the private corporate sector by Ghanaian banks. In this first chapter of the dissertation, I have provided a background to the study, identified the problem, and stated the purpose of the research. I also posed my research questions, stated my hypotheses and assumptions, delineated the scope of the study, set the limits, and delimited the research. I also defined key terms and indicated the potential contribution of the research to positive change in the lives of Ghanaians.

Chapter 2 is a review of relevant literature in support of the research. I begin the chapter with a discussion of my strategy for reviewing literature. I indicate the scope and the source of literature reviewed. I also discuss the theoretical foundation on which I based my research and followed it up with a detailed review of the literature on FCO. The review of FCO includes a discussion of the definition, theories, determinants, and methods of assessing the presence and operation of the phenomenon in an economy.

Chapter 2: Literature Review

The GoG borrows from domestic and foreign sources to finance the budget deficit. In 2013, 55% of the public debt was from domestic sources (Ministry of Finance, 2015). Government's domestic borrowing is competitive and has a potential crowding out effect on PSCs. FCO theory is not conclusive (Aisen & Hauner, 2013) and not proven specifically for Ghana. Therefore, the specific research problem was whether the government's domestic debt caused FCO in Ghana.

The purpose of this quantitative research was to investigate the presence of FCO in Ghana. I did this by examining the relationship between the government's domestic debt and the credit advanced to the private corporate sector by Ghanaian banks. In this chapter, I discuss the theoretical bases of my research, followed by a detailed review of the literature on FCO and its determinants: the cost of credit and the quantity of credit. I end Chapter 2 with a preview of the methods of measuring the presence of FCO in an economy.

Literature Search Strategy

I designed my literature review to provide a comprehensive examination of the subject matter. I undertook my research using the Walden University library's resources, the Google Scholar search engine and, to a limited extent, the Google main search engine. Within the Walden University Library resources, I relied on the Business Source Complete and the Academic Source databases for my literature. I also set up a Google alert for published articles on *FCO* and *government debt* as they related to my research topic. The alert service provided a continuous source of latest articles on my research topic. Occasionally I would also use the Thoreau database to

provide additional research material not specifically related to finance. I also used relevant textbooks and encyclopedias when necessary.

Scope of the Literature Review

Peer-reviewed literature. Walden University requires the use of peer-reviewed literature only. Using the Walden library search engine, I could select peer-reviewed literature by specifying the selection criteria. The peer review feature is, however, not available through the Google Scholar search engine. I, therefore, used the "verify peer review" feature available through the Walden library to check the status of every journal article that I sourced from Google.

Years reviewed. As much as practicable, I kept the age of my reviewed articles within a 5-year band. Accordingly, the publication dates of 55% of my reviewed articles were between 2013 and 2017. Some of the pieces that fell outside the time range were either seminal, provided definitions and background information, or were those that I needed to include to provide better and complete explanation of the issues under discussion. Some of these were articles by Ho and Saunders (1981) and Myers (1984). Twelve percent of all references related to my methodology and 8% were from institutional websites. Institutional articles were not necessarily peer reviewed but provided background information critical for explaining issues, especially as pertained to the Ghanaian situation. These sources were the Bank of England (2015), the Bank of Ghana (2017), the Ministry of Finance and Economic Planning of Ghana (Ministry of Finance, 2015), and the World Bank (2013, 2014).

Strategy for Reviewing the Literature

Framework for the review. The first task that I undertook was to design a framework within which the literature review would take place. The framework,

shown in Figure 1, served as my guide for a systematic search, review, acceptance, or rejection of selected articles.

Keyword search. The bulk of the search revolved around keywords. The main keyword was *financial crowding out* (*FCO*). I conducted searches related to FCO definition, theories, *indicators*, and *measurements*. FCO manifests in increased *cost of credit* and reduced *quantity of credit* to the private sector. *Interest rates*, the *interest rate spread*, and the *net interest margin* measure the cost of credit. Interest rates are affected by *macroeconomic factors* such as *gross domestic product* (*GDP*), *inflation*, and *exchange rates*, all of which became search terms.

Both the cost of credit and the quantity of credit are affected by *bank operational costs* and *savings habits* of households and firms. Theories that explain the savings habit such as the *loanable fund's theory* and *the quantity theory of funds* also emerged as search terms. The quantity of credit available for lending is also a function of the central bank's *reserve requirements*, *the monetary policy*, *budget deficits*, and the *fiscal policy* of the government. I adopted these as my search terms for the literature review.

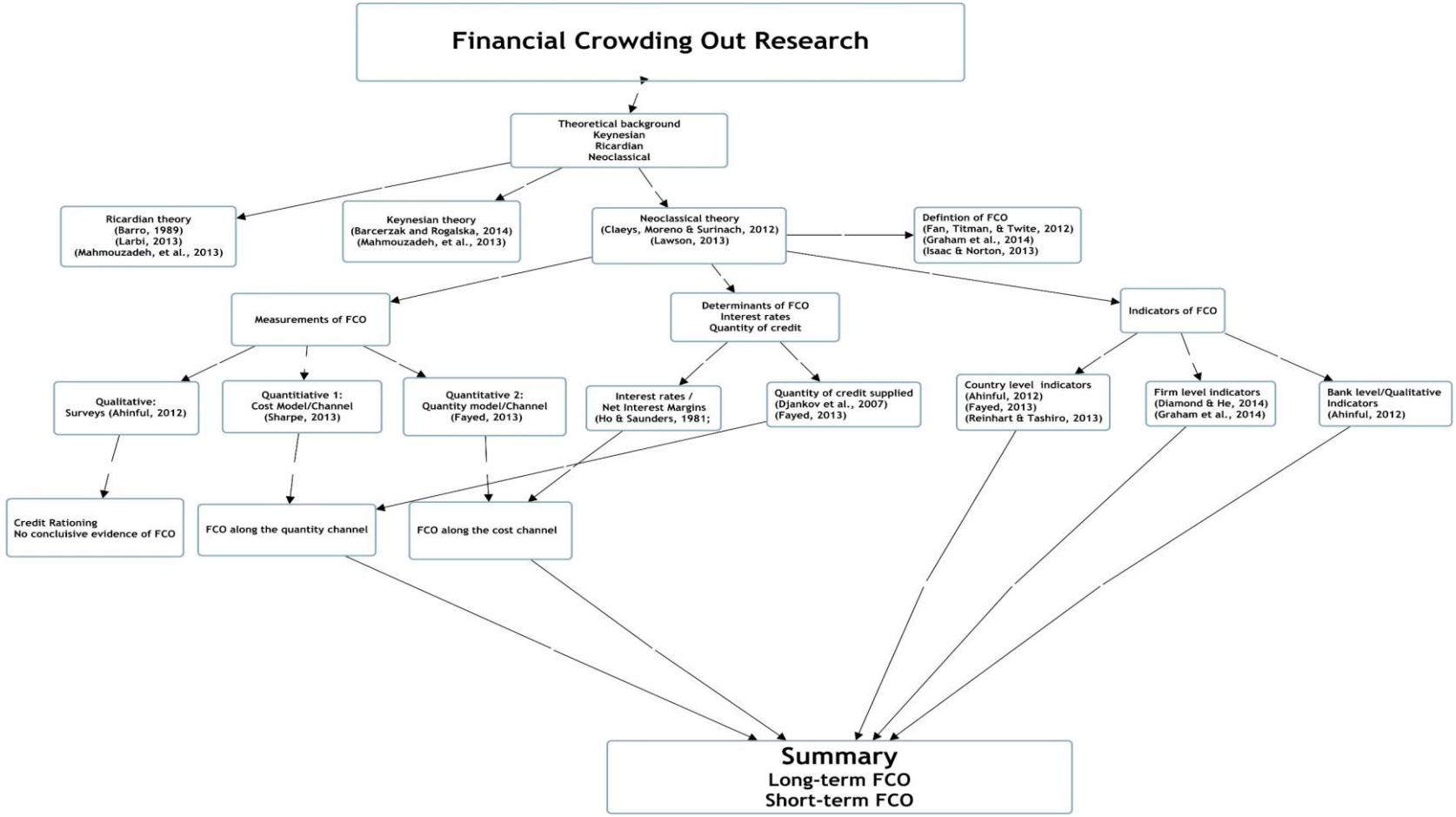

Figure 1. Literature review organogram.

Theoretical Foundation

Three schools of economic thought or theories define and describe the FCO phenomenon. These are the neoclassical theory, the Ricardian equivalence theory, and the Keynesian theory. Each theory reflects a unique position regarding the phenomenon.

Ricardian Equivalence Theory

The Ricardian equivalence theory, as posited by Barro, (1989); Larbi, (2013); and Mahmoudzadeh et al. (2013), is that when a government tried to increase borrowing, demand for credit remained unchanged. Barro (1989) explained the theory that households' response to the government's demand for credit to finance the budget deficit is to increase their level of savings in anticipation of future tax increases. Hence, the presence of government debt increases savings that will increase the quantity of credit available to borrowers. Banks do not have to increase the savings interest rates to attract these extra savings. Thus, the cost of credit available to firms will remain unaffected, and private investment will also remain unchanged. In sum, the Ricardian theory does not support the crowding out effect.

Some researchers have refuted the claims of the Ricardian theory. Schlicht (2013), in refuting the theory stated that its premise, the rational behavior expectation of households, invalidated it because it omitted interest payments on the public debt. Schlicht argued that extracting interest payments on government debt from households will reduce their savings. Thus, there will be a reduction in the volume of funds available to the banks to extend credit to borrowers. The author concluded that the rational behavior of households would not support the Ricardian theory.

Caparole (2015) also argued against the Ricardian equivalence theory. Using the efficient markets model of interest rates, Caparole researched the influence of taxation on interest rates in the U.S. bond market and found a significant negative relationship between the two. The author concluded that the effect of externally imposed taxes on interest rates did not support the Ricardian theory of FCO.

Keynesian Theory

The Keynesian approach to FCO argues a complementary relation between credit supply and government spending (Mahmoudzadeh et al., 2013). The theory states that public expenditure signals positive economic conditions to the private sector, which responds with higher investments. Government spending will, therefore, have a crowd-in effect on the private sector's investment. However, when Balcerzak and Rogalska (2014), and Mahmoudzadeh et al. (2013), analyzed data from different countries using the Keynesian IS-LM framework, they found that the theory yielded different results depending on the type of government spending. Expenditure on capital formation yielded a crowd-in effect for all countries they investigated, whereas consumption spending led to crowding out in developed economies but a crowd in developing countries. In both cases, however, the results were marginal implying a weak explanatory power of the theory. Also, Balcerzak and Rogalska found contradicting results from the same country when they applied other methods or used different data periods. These finding led me to conclude that the Keynesian theory is not reliable for explaining FCO in an economy.

Neoclassical Theory

The neoclassical theory evolved from and is considered a continuation of the classical theory espoused by Smith (Lawson, 2013). In classical theory, the

distribution of the production of an economy is proportional to the cost incurred by different strata of society in production. Hence, the price of a product will reflect the cost of production.

Researchers, however, quickly noted that people are willing to pay more than the production cost to acquire a product, leading to the formulation of three basic assumptions that underpin the neoclassical theory. Weintraub (2002) stated these theories to be that individuals, households, and firms have rational preferences among outcomes; individuals maximize utility and firms maximize profits; and all persons act independently using all the information available to them. The neoclassical theory thus explains the notion of value (i.e., the relationship between an object and its acquirer) and leads to the formulation of relationships among demand, supply, and price. The price of a good comprises both the cost of production and the value placed on it by the demanders and suppliers. Price, therefore, determines the relationship between the quantities demanded and supplied. Producers are willing to sell at the highest price they can get whereas buyers will want to purchase at the lowest price possible. Price then becomes the clearing mechanism for market operations in neoclassical theory.

Weintraub (2002) stated that neoclassical theory dominated economic discussions. Researchers use the theory to spawn new ones rooted in its basic assumptions. Thus, there is a neoclassical theory of FCO, which was the theory that I preferred for my research.

The neoclassical theory postulates a rational relation between demand and supply of resources. The theory, as it related to access to credit, (Aisen & Hauner, 2013; Claeys et al., 2012), posited that increases in budget deficits have a direct

correlation with interest rates. The rationale behind this theory is that growing demand for credit by the government to finance the budget deficit exerts an upward pressure on interest rates. Higher interest rates increase the probability of bankruptcy for borrowers, and thus rational managers will refrain from issuing debt, that is, they will be crowded out.

The ability to apply rigid mathematical formulae for testing hypotheses is the major advantage of the neoclassical approach. The fields of economics and finance have a strong tradition of repeated applications of mathematical modeling to explain phenomena. Both Weintraub (2002) and Lawson (2013) averred that neoclassical theory lends itself to a deductive approach, that is, the process of relying on mathematical correlations to provide explanations for events. Coad (2007) stated that neoclassical theorists have developed an impressive set of mathematical models that enable objective tests of economic theories.

Bernheim's (1989) seminal paper on budget deficits guided my adoption of the neoclassical approach. Bernheim disaggregated deficits into permanent and temporary components. Permanent deficits are long-term while the temporary, year-on-year deficits are deviations from the norm. The neoclassical analysis sheds light on the effect of the permanent deficit while Keynesian analysis concerns itself with the effect of temporary deviations. Temporary deviations, however, are not useful for studying and testing theory. The analysis of deficits and the subsequent enactment of policies must, therefore, adopt the neoclassical approach. Bernheim advised that the neoclassicist should focus on the total outstanding public debt instead of year-to-year changes to provide a more informed measurement of the impact of government's fiscal policy on capital formation and consumption. Neoclassical theorists have, as

noted by Coad (2007), developed the right mathematical framework and models to enable this analysis. Such an analysis may yield results which can inform public policy in support of a positive social change.

Literature Review

FCO refers to an increase in cost and a reduction in the quantity of credit to the non-financial private sector resulting from government competition for loanable funds from the financial market (Graham, Leary, & Roberts, 2014). Sharpe (2013) stated that the phenomenon resulted from borrowing from domestic lenders to finance rising public debt and budget deficits leading to increases in interest rates. Agnello and Sousa (2013) indicated that rising government debt imposed a fiscal shock on asset prices that manifest in reduced access to affordable credit for businesses. A decline in credit conditions can be a major obstacle to business and can affect their survival (Haselip et al., 2014).

FCO is, therefore, a phenomenon created by the actions of government and its institutions on the money market. Governments, operating through their central banks, play the role of regulating the amount of liquidity available to the private sector of the economy. In times of excessive liquidity, the central bank intervenes by selling financial instruments in a mop-up exercise. During periods of low liquidity, central banks release extra funds into the market by selling bonds and other financial instruments, or by creating new money in a process described by the Bank of England (2015) as quantitative easing. These actions form part of monetary policies designed to keep inflation on target. However, under circumstances of budget deficits, governments' purchase of credit from the market can become excessive and may exclude other players from accessing funds. Fan, Titman, and Twite (2012) described

the borrowing activity of government as FCO while Agnello and Sousa (2013) called it a negative fiscal shock.

FCO also occurs under other actions of central banks and public institutions. Foreign reserve accumulation, a process in which central banks purchase foreign debt to stabilize the local currency, can have a crowding out effect on domestic businesses. Reinhart and Tashiro (2013) reported that in the wake of the 1997 financial crisis, Asian central banks embarked on the purchase of foreign reserves as a measure to cushion their currencies against depreciation. The action had the effect of limiting the amount of credit available to their private sector borrowers thus crowding them out of the credit market.

The preferential treatment of government-owned businesses in gaining access to credit is another cause of FCO for private business. Private sector firms are unable to compete with government-owned or government-sponsored institutions that receive preferential treatment in access to government contracts, supplies, and tax treatment. Under these circumstances, even in the presence of loanable funds, the private sector will not invest because of the potential for low returns on their investments. Menon and Ng (2013) described the phenomenon when they studied the effect of the operations of government-linked corporations (GLCs) on the investment activities of other corporate entities in the Malaysian economy. They found that where GLCs control about 60% of the market, non-GLCs receive such low returns on capital employed that investments were not worthwhile, effectively crowding them out of the investment market.

Crowding out can operate in reverse. A reversed crowding out phenomenon exists when the government is crowded out especially in the provision of services.

Isaac and Norton (2013) described a scenario of reserve crowding out in which service delivery by, for example, non-governmental organizations (NGOs) crowded out government from providing these services. Health, education, and other social services benefit from provision by NGOs which can crowd out government supply. However, I will not consider the crowding out described by the authors because it does not conform to the definition of crowding out I have adopted in this research.

FCO is not directly observable in an economy or a firm. However, there are directly observable events or measurable variables that can serve as pointers to the existence of the phenomenon. These indicators operate at the country and corporate levels.

Country-Level Indicators of Financial Crowding Out

The variables and events that indicate the presence of FCO in an economy are increasing accumulation of foreign reserves (Reinhart & Tashiro, 2013), public investments, domestic and external public debt, and the degree of integration with other economies (Broner et al., 2014). Other indicators are the Treasury bill rate (Fayed, 2013), policy rate, reserve requirements, and domestic savings.

Accumulation of foreign reserves. Capital flies from an economy through the acquisition and accumulation of foreign reserves, a measure adopted by central banks to shore up the currency against foreign currencies. The purchase of foreign exchange by the central bank is an indication that the private sector in the country is likely to be crowded out of credit for investment purposes due to the reduction in the available loanable funds. Reinhart and Tashiro (2013) therefore, defined FCO to include the purchase and accumulation of foreign reserves by a central bank.

Treasury bill rates. Treasury bills are debt instruments sold and bought by the central bank. The Treasury bill rate represents the price the central bank is willing to pay for its debt. Movements in the rate can, therefore, serve as an indication of the demand for debt. The higher the rate, the more debt the public and banks will be willing to purchase from the government or the central bank, and the less the amount available to the private sector (Fayed, 2013). Therefore, movements in the Treasury bill rate can proxy for the presence of FCO in an economy.

Monetary policy rate. The monetary policy rate, the rate at which the central bank sells short-term debt to banks can serve as an indicator of the cost of debt in the country. Central banks announce the monetary policy rate periodically, usually on a quarterly basis. They use the rates to expand or contract the economy by reallocating credit between the private and the public sectors as explained by Broner et al. (2014). In an expansionary policy, the central bank will lower the rate to make government securities unattractive. A contractionary policy increases the policy rate thus increasing the cost of credit and restricting the supply of loans to the market. Addo and Seyram (2013) found a positive correlation between the policy rate and bank borrowing rates in Ghana which suggests that the policy rate may serve as an indicator of the potential for FCO of the private sector. The reaction of banks to these policies, however, do not always correlate with the actions of the central bank. Banks may resist the urge to increase interest rates in response to increases in the policy rate to attract and serve high-quality clients. Banks may also refuse to reduce lending rates if they perceive a recession. Notwithstanding these exceptions, Amidu (2014) noted that the policy rate always influences lending and bank managers will normally set the interest rates on bank debt instruments higher than the policy rate.

Reserve requirements. Central bank reserve requirements have a negative correlation with the quantities of loans banks can make available to their customers. The central bank requires banks to deposit a fraction of clients' savings as reserves. The higher the reserve requirements, the less the deposits available to extend as credit, and the higher the cost due to a higher non-interest earning liabilities carried by the banks (Addo & Seyram, 2013). Banks will, according to Ahinful (2012), then resort to credit rationing as a demand management strategy. Thus, movements in the statutory reserve requirements can serve as an indicator of FCO of bank customers.

Public investments. Public spending is an indicator of FCO or crowding in. As noted by Bello, Nagwari, and Saulawa, (2012), and Traum and Yang (2015), some government expenditures crowded in while others crowded out credit. In Nigeria for example, Bello et al. (2012) found that public spending on manufacturing and construction crowded out the private sector while expenditure on education, health, agriculture, communication, and transport infrastructure crowded in private investments.

Domestic savings. An increase in government spending leading to a rise in the budget deficit reduces the level of national savings by both the public and private sectors. The effect of such action is a reduction of loanable funds on the market (Sharpe, 2013). Under conditions of credit supply constraints, government debt, used to finance increased spending, competes with private debt, exerting upward pressure on market interest rates. When the government decides to fund the increased spending through taxation, according to Sharpe (2013) and Traum and Yang (2015), the result is a reduction in both public and private savings. There is also a corresponding decrease in the size of loanable funds available to industry. A persistent reduction in

domestic savings, therefore, is an indication of crowding out of the private sector from the financial market in the country.

Economic integration. FCO correlates with the economic development of a country as well as its degree of integration with other economies. In developed economies, deficits may not have any effect on the financial markets resulting in a minimum incidence of crowding out. Where economies are integrated, the spillover effect of the international bond market mitigates FCOs. Government debt instruments are tradeable (Broner et al., 2014) thus minimizing the impact on the local economy.

Public debt. In emerging and low-income countries, there is a more severe effect of deficits. In what they described as a laissez-faire approach to banking, Fayed (2013) and Shetta and Kamaly (2014) described the phenomenon of emerging country banks purchasing government bonds at the expense of credit to the private sector. The sale of bonds by governments to pay for the public debt creates conditions for the operation of FCO in developing countries.

Sovereign borrowing has a direct correlation FCO. Agca and Celasun (2012) examined the relationship between sovereign debt and the cost of borrowing in countries where there has been a default on sovereign debts. They found a positive correlation between the cost of corporate borrowing and the level of sovereign borrowing: the more a country borrowed from foreign lenders, the higher the cost of credit to its business sector from foreign banks. Significantly, they also found that the cost of lending to the corporate sector by foreign lenders increased substantially in countries where the sovereign debt was perceived to be at risk of default, and where there was weak legal protection for creditors. These findings indicated that the phenomenon of FCO was not limited to domestic markets.

Firm-Level Indicators of Financial Crowding Out

FCO from the perspectives of the firm manifests in the holding of cash and other short-term securities (Graham et al., 2014). When businesses increase their holdings of cash and other short-term securities, it serves as an indication that government may be crowding out the private sector. Firms anticipating crowding out may also hold foreign treasuries instead of corporate bonds and will resort to reduced capital expenditures.

A company's debt can also result in the crowding out of investments according to Diamond and He (2014). A substantial debt overhang can cause a firm to refuse to invest in positive net present value projects because of the perception that the proceeds will service the debt. Thus, the debt creates a crowding out effect on new investments in the firm.

Qualitative Indicators

Credit rationing is a leading qualitative indicator of FCO. Banks choose credit rationing as a demand management strategy (Ahinful, 2012) whereby they deny some clients credit irrespective of the interest rate there are willing to accept. Credit rationing is not an observable behavior as noted by Bellier, Sayeh, and Serve (2012). Field surveys remain the only way of acquiring data. In Kumasi in Ghana, for example, Ahinful (2012) found that 41.7% of respondents in a survey needed five times more credit than their banks granted them. Ghanaian banks allocate credit to clients based, according to Ahiawodzi and Sackey (2013), on borrower information and not on interest rates, even though the Ghanaian financial market has liberalized interest rates.

Determinants of Financial Crowding Out

The indicators of FCO emphasized two variables--interest rates (Sharpe, 2013) and the quantity of credit (Djankov et al., 2007; Fayed, 2013) as the key determinants of the phenomenon. In this section, I discuss the two variables, their different definitions and their effect on FCO.

Interest rates. Interest rates are the cost and benefits of using or giving up the use of money respectively for a period. The interest rate on loans, expressed as a percentage of the balance outstanding, may be fixed or variable depending on the terms of the loan agreement. There are different definitions of interest rates based on its application (Aboagye, Akoena, Antwi-Asare, & Gockel, 2008). For the lender, it is the fee charged for supplying the funds and represents the opportunity cost of forgoing the use of the money for alternative purposes. From the perspectives of the borrower, an interest rate is a cost incurred for using other people's money. When the same institution is responsible for attracting both lenders and borrowers, the difference between the lending and borrowing rates is called the interest rate spread.

Classification of interest rates. The classification of interest rates varies with purpose. Classification can be by the length of maturity, by their relation to the economy, by their rigidity, by type of instrument, by mode of compounding, and by its application on the market. Maturities can be short-term--up to 1 year; medium-term--more than 1 year but less than 5 years; and long-term--more than 5 years. Interest rates can be nominal or real. The nominal interest rate denotes the speed at which invested money will grow over a period (Berk & DeMarzo, 2014), while the real interest rate is the nominal interest rate adjusted for inflation.

Let:

n = nominal interest rate

r = real interest rate

i = inflation rate,

Then, $r = (n - 1)/(1 + i)$ and for small values of i, $r = n - i$.

The real interest rate indicates the purchasing power of the invested sum and earned interest. Real interest rates can be positive or negative depending on the rate of inflation. Where the real interest rate is also the discount rate, there is an adjustment of the cash flows to account for inflation, that is, the cash flow is in real terms. However, given the constant movement in inflation rates, Berk and DeMarzo (2014) cautioned against the use of the real interest rate and instead recommended the nominal interest rate as the discount rate.

The rigidity of interest rates and type of financial instrument serves as modes of classification. Thus, there is a fixed interest rate, a variable or floating interest rate, or a combination of the two in a loan agreement. Berk and DeMarzo (2014) defined a floating interest rate as one which varies with the demand and supply of loans in the market. A fixed interest rate is set ab initio determined by several internal and external factors affecting the issuing institution. There are also deposit instruments such as savings, time, and some demand or current accounts with different interest rates. Investment instruments like bonds and securities have different classifications depending on the tenor.

The mode of compounding of interest rates is another criterion for classification. Interest calculation is simple or compound. In simple interest calculations, the principal earns interest at specified intervals. In compounding mode, the sum of the interest and the principal in a preceding period serves as the principal

for the next interest calculation period. Thus, there is a continuous change of principal throughout the tenor of the investment or loan.

Compounding can be at discrete intervals or continuously throughout the tenor of the investment or loan. Discrete compounding calculates interest accrued on the previous period's principal at fixed or specified intervals. The intervals can be annual, semiannual, quarterly, monthly, or daily. Continuous compounding estimates interest on a continuous basis by assuming that there is no interval between compounding periods. The relation, $i = e^{rt}$, where *r* is the interest rate and, *t* is the time elapsed yields the accrued interest, *i*, at any time.

Two other classifications of interest rate are the spot and future rates. The spot rate is the rate applicable on-the-spot, that is, today's interest rate applied to an investment maturing on a specific date. A forward interest rate is a rate that applies to an investment in a future period. Forward rates are forecast and may not be attainable in practice.

Other important interest rates for making capital investment decisions include:

- Base rate—this is a rate set by banks and serves as the starting-point for loan negotiations. The rate has four modules namely the cost of funds, return on equity, provision for bad debt and risk premium. The BoG provided a formula for calculating this rate to introduce more transparency into the banking sector in Ghana. The BoG requires banks not to lend below the advertised base rates that it adjusts the rate periodically to reflect changes in the larger market.
- Policy rate—the rate which central banks charge on loans made to commercial banking institutions. In Ghana, the policy rate design is targeting single-digit inflation (Bank of Ghana, 2014).

- Commercial paper rate—these are short-term discount bonds issued by established corporate borrowers to mature in 6 months or less.
- Treasury bill rates--central banks issue these bills at fixed interest rates. These are short-term measures to increase or reduce the amount of credit in the economy. The BoG issues 91-day and the 182-day Treasury bills. Treasury bills are risk-free, sold at a price less than the value at maturity, and operationalize both the fiscal and monetary policies of the government.
- Government bond rates—government issues debt at a fixed rate to raise funds. In Ghana, the government has 1, 2, 3, 5, 7, and 10-year bonds on the market. It also has longer duration bonds issued in the international markets. The bonds have different interest rates related to their maturity.
- Corporate bond rate—corporations issue debt instrument as a means of raising long-term financing. Bonds have different interest rates based on the time to maturity and the risk profile of the issuing institution. The corporate bond market in Ghana is nascent but promising (Ghana Stock Exchange, 2016).

Determinants of bank interest rates. Bank interest rates represent the risk banks associated with lending to a customer. Interest rates also reflect the cost of obtaining and managing the funds that the bank makes available to the borrower. Banks retain the power to determine how much interest a borrower must pay on the borrowed sum. In some instances, the interest rate will be subject to negotiation between the lender and the borrower, but the lender still retains the right to determine the final rate. Several factors influence and determine the interest firms should pay for borrowing. Macroeconomic conditions, financial industry parameters, bank-specific, and firm-specific factors come into play in determining the interest rate.

Economic conditions. Entrop, Memmel, Ruprecht, and Wilkens (2014) averred that both macro and micro economic conditions affect interest rates. The macroeconomic conditions reflect the uncertainty surrounding interest rate changes whereas microeconomic conditions involve exposure to risks. Banks, therefore, price their loans to include the risks associated with both conditions.

The macroeconomic conditions which affect the interest rate spreads are, according to Churchill, Kwaning, and Ababio (2014) GDP, exchange rate, prime rate, and the Treasury bill rate. Among these variables, they found GDP to be negatively correlated with the spread whereas all the other variables had a positive relation. Another variable that affects interest rate spread is the level of inflation in the economy. Mensah and Abor (2014) stated that the degree of inflation correlates positively with higher NIMs in Ghana. Meanwhile, Were and Wambua (2014) reported that in Kenya, macroeconomic factors such as economic growth were not significant determinants, and neither was the monetary policy rate of the Bank of Kenya even though it had a positive correlation with interest rate spreads.

Bank level. At the bank level, the determinants of interest rates include liquidity, overhead costs, loan loss provisioning, and profit margins. Additionally, Gambacorta and Mistrulli (2014) intimated that the relations between the bank and the customer could influence the interest rate charged. A close lending relationship between a bank and a customer will result in a lower cost of borrowing for the client.

Gambacorta and Mistrulli (2014) also noted that a bank's business model plays a significant role in interest rate setting. Banks which specialize in lending tend to have lower interest rates. Also, banks with substantial capital and liquidity buffers,

and those which require securitization of loans are more likely to charge lower interest rates.

The risk associated with lending is another influencing factor and one of the determinants of the interest rate charged by banks. Entrop, et al. (2014) observed a positive correlation between interest rate and risk. Banks may increase the interest rate premium when interest payments face an uncertain future but will adopt a more favorable regime at lower perceived risks.

Other determinants of interest rates are, according to Were and Wambua (2014) the size of the bank, credit risk, return on average assets, and operating costs. Mensah and Abor, (2014) also added that executive compensation, asset size, the level of concentration in the banking industry, capitalization, and the reserve requirements correlates positively with higher NIMs. The authors also suggested that corporate governance could be critical in determining IRS, noting that rent-seeking managers would seize every opportunity to tweak the IRS to their advantage.

Interest rate measurement. A review of the classification of interest rates reveals the potential for a multitude of deposit and lending interest rates. Such a multiplicity of deposit and loan types, applicable rates, and conditions made the World Bank (2014) declare the limited utility of interest rate as a tool for comparison or analysis across the board. The limitation spawned a surfeit of definitions of the interest rates as researcher's devised different means of measuring the variable. The most popular proxies are the interest rate spread and the net interest margin which was preferred by Ho and Saunders (1981). I discuss these two proxies in the sections following and indicate my preferred choice.

Interest rate spread. The IRS is the difference between the interest charged on loans and the interest paid on deposits. However, because of the several different definitions of interest rates, the IRS also has several definitions and measurements. Gambacorta and Mistrulli (2014) for example, measured the IRS as the difference between the interest rate charged on credit lines (i.e., overdrafts) and the 3-month interbank rate. Mannasoo (2013) estimated the spread using two definitions: first, the loan-deposit spread, calculated as the difference between the loan and deposit interest rate; and second, the loan-Euribor spread, computed as the difference between the loan rate and the Euribor 6-month rate. These two examples give an indication of the potential of deriving many and different spreads based on the frame of reference of the research.

The role of IRS. The IRS is a measure the efficiency of a bank or the entire banking industry in a country. Cull, Demirguc-Kunt, and Morduchp (2014) estimated the IRS as the difference between a bank's lending and deposit interest rates and posited that it served as a proxy for assessing the efficiency of the banking industry. The correlation between the IRS and efficiency is negative, that is, the higher the spread, the less efficient the bank, and vice versa.

IRS also serve as a proxy for gauging the FCO of households and industries in a country. Mannasoo (2013) posited that lower IRS increase access to credit which can serve as a boost for economic growth. Therefore, IRS has a direct link to the GDP of a country, all things being equal.

Determinants of IRS. Studies of the determinants of IRS yielded three variable groups--bank specific, macroeconomic, and industry-specific. Researchers

use the three variable groups in their assessment of IRS. For example, Ho and Saunders (1981) derived the net spread as in Equation 1:

$$s = \alpha/\beta + 0.5R\sigma^2_I Q \quad (1)$$

where:

$\frac{\alpha}{\beta}$ = pure spread or bank risk-neutral spread

R = the bank's management's coefficient of absolute risk aversion

Q = the size of bank transactions

σ_I^2 = the instantaneous variance of the interest rate on deposits and loans

Ho and Saunders (1981) inferred that modeling could yield the pure spread. They also showed that pure spread is a function of four factors: the degree of managerial risk aversion, the size of transactions undertaken by the bank, bank market structure, and the variance of interest rates.

Following their work, researchers established other determinants for modeling the impact and effect of the IRS. Were and Wambua, (2014) identified bank-specific factors that play significant roles in the determination of IRS. These include bank size, credit risk as measured by the ratio of non-performing loans to total loans, return on average assets, and operating costs. These factors have a positive correlation with IRS. Higher bank liquidity ratio, on the other hand, hurts the spreads. On average, big banks have higher spreads than small banks.

Sheriff and Amoako (2014) showed that some of the determinants of the IRS in Ghana were inflation, total deposits, Treasury bill rates, and domestic public borrowing. Gambacorta and Mistrulli (2014) also found that the borrower's relationship with the bank, securitization, and the degree of lending as a proportion of banking operations affected the interest rate pass through. Churchill et al. (2014) also

found the determinants of the IRS in Ghana to include GDP, inflation, exchange rate, prime rate, Treasury bill rate, liquidity position of banks, overhead costs, loan loss provisioning, and profit margins. Banks' operational variables including their hedge against deposit and loan maturity asymmetry and macroeconomic changes in interest rates were key determinants according to Entrop et al. (2014). They also found that banks price the interest risk premium based on interest income and expenses after controlling for earnings that arise from bank-specific maturity structure. Haruna (2012) added that banks hide the actual cost of lending in the fees and commissions they charge borrowers. Banks do not report these charges as part of their interest income thus giving the impression of low-interest rates while the effective interest rate is high. Therefore, the real IRS shall be calculated to include fees on loans levied on borrowers. His definition of IRS is by Equation 2:

IRS = (*interest plus commission received*/*total earning assets*) – (*interest plus commission paid*/*interest-bearing liabilities*) (2)

The definition by Haruna (2012) is very similar to the definition of NIM which suggests that the NIM may be a better variable to use in assessing the presence of FCO in an economy.

***Concluding remarks on the IRS*.** The preceding suggests that interest rates and their spreads are stochastic. Modeling can deduce the pure spread (Ho & Saunders, 1981), but determining the actual spread can be challenging. Ghanaian banks publish their base rates (Business Ghana, 2015) but do not disclose their interest rates. Thus, any research in Ghana that relies on the IRS is likely to encounter difficulties in assembling credible data compared with the NIM.

Net Interest Margin

The NIM is the net interest income expressed as a percentage of the total average earning assets. The NIM thus measures the difference between interest earned on assets and interest paid on liabilities according to Amuakwa-Mensah and Marbuah (2015). It has the advantage that it accounts for a bank's investment of non-interest-bearing liabilities in income earning assets. For example, current account deposits earn no interest income to the holders, but the bank can invest such sums in income earning assets for its benefit. The NIM has a direct relation with and derives from the IRS. NIM has better utility for research because it is directly observable compared with the IRS. NIM also aggregates all interest rates charged and paid on banks' earning assets and liabilities without regard to the different rates applied to individual customers.

Role of the NIM. While both the IRS and the NIM measure the profitability of banking operations, the IRS is an average rate that applies only to interest-earning assets and liabilities. The NIM, on the other hand, measures the actual amounts paid and received by the banks on their assets and liabilities including non-interest earning liabilities. The NIM thus provides a real measure of the earnings from the intermediation services provided by the bank as noted by Ho and Saunders (1981). By relating NIM to the asset base of the bank, NIMs can be aggregated for all banks thus making it appropriate for industry-wide research.

Determinants of NIM. The determinants of the NIM are similar to the determinants of the IRS because they are both measures of interest rates on loans and deposits. Therefore, the NIM is affected by the same macroeconomic factors, bank-specific factors and industry factors identified by Agca and Celasum (2012); Mensah

and Abor (2014; and Sharpe (2012). Equation 3 defines the relationship between the NIM and these factors:

$$NIM = f\{industry\ variables;\ macroeconomic\ variables;\ bank\text{-}specific\ variables\} \quad (3)$$

According to Mensah and Abor (2014), the bank-specific variables include bank-specific risk (loans-to-total-assets), bank size (log of total assets), and bank efficiency (cost-asset ratio). The industry-specific variables are the level of competition among banks captured by the HHI, the capital asset ratio, and the statutory reserves imposed by the regulator which represents non-income earning liabilities. The macroeconomic variables are inflation, the volatility of interest rates proxied by the standard deviation of the 91-day Treasury bill rate, and the exchange rate. Other variables are public debt represented by the ratio of government debt to GDP and the budget deficit, (Agca & Celasun, 2012).

Application of the NIM in research. Researchers' make extensive use of the NIM. Ho and Saunders (1981) were some of the early adopters of the NIM in their seminal paper on the determinants of bank interest margins. Researchers modified and adapted the original equation by Ho and Saunders (1981) to suit different research objectives related to IRS. Entrop et al. (2014) adopted NIM in their study of the pricing of interest risk exposure in bank margins in which they extended the model of Ho and Saunders (1981). Mensah and Abor (2014) study of the relationship between IRS and agency conflict in Ghanaian banks regressed NIM with executive compensation, macroeconomic factors, and bank-specific factors. These researchers provided the justification for adopting NIM as my proxy for the interest rates on loans and, by extension, the cost of borrowing to Ghanaian businesses. In my research, I

used data from the databases of the BoG and the World Bank. I adopted the definition of NIM as the accounting value of a bank's net interest revenue as a percentage of GDP.

Quantity of Credit

The second variable for assessing FCO is the demand and supply of credit to the private sector. The use of the quantity of credit as a research variable was the preferred approach by Djankov et al. (2007) and Fayed (2013) in what they called the quantity channel. Credit is the money received and used in the present for reimbursement later, otherwise known as bank loans (Bernanke & Blinder, 1988). The demanders of credit pay interest on the amount received for the privilege of using other peoples' money. The suppliers of the money receive the interest as compensation for forgoing the use of their money in the present. The arrangement between the demanders and suppliers can be private, that is, between the two parties without an external intermediary, or through an intermediary for a fee. The role of intermediaries evolved due to information asymmetry between the parties. Banks have assumed the role of intermediaries in the demand and supply of credit (Ho & Saunders, 1981) and bear the risk of guaranteeing a refund of deposits to the suppliers. For their services, Haruna (2012) stated that banks levy the cost of intermediation on the interest rates, commissions, and fees they charge the borrowers.

Neoclassical theory suggests that the demand and supply of credit should follow purely economic principles (Lawson, 2013). Demand will follow an upward sloping curve while supply exhibits a downward sloping curve. The interest rate charged by banks for granting credit then serves as the clearing mechanism. Following from Say's law, the demand for credit should provide its supply. However,

recent events such as the financial crisis involving subprime loans and other market imperfections make it difficult to operationalize the law.

Classification of credit. Credit consists of two components--the direct demand for credit through loan applications, and the sale of all classes of interest-bearing financial assets denoted as bonds, as a means to raise funds. Credit classification is in several different ways. Classification can be by type of security, payment plan, tenor, or by a combination of these classes.

Credit may be securitized or not. Bankers secure credit by placing a lien on an asset belonging to the borrower. In the event of a default, the lender can sell the asset to defray the loan amount outstanding. Trust underlies the use of unsecured credit. There is no collateral, but the expectation is that the borrowers will honor their obligations. Government debts, for example, are unsecured but backed by full faith in the government that it will honor its obligations when it falls due.

The repayment plan can be a means of classifying credit. Installment credit allows the borrower to make fixed periodic payments on the loan amount. A balloon makes one payment of the entire amount and the interest at the end of the term.

Another classification of credit refers to the frequency of borrowing. A revolving credit or an open-ended loan allows the borrower to borrow as often as needed up to a limit set by the creditor. There are requirements for the borrower to make periodic repayments according to terms agreed by the parties. A closed-end loan is a one-off arrangement without the option of renewal, that is, each loan application is a stand-alone agreement.

Loans may be conventional or non-conventional. Unconventional loans may be insured by or be provided by the government through a nominated bank.

Governments may use unconventional loans to target specific sectors of the economy or as part of special economic programs. Conventional loans, by contrast, are not insured by the government and can be considered pure loans extended by the banks as part of their operations.

The tenor of a loan is one determinant of its classification. Loan durations may be short-term or long-term. There are different classifications of tenor depending on the source of the funds. Short term loan maturities range between 1 and 3 years whereas long-term loans last more than 3 years. Some definitions also introduce a mid-term loan which lasts between 1-to-3 years.

Bonds have similar classifications, but with higher tenors. A short-term bond may have a tenor of 5 years, a mid-term bond between 5-to-10 years and a long-term bond is usually more than a decade with many lasting up to 30 years (Dass & Massa, 2014). The difference between a bond and a loan is that bondholders can trade them on the bond market. Bondholders, therefore, do not have to hold until maturity. Instead, they can trade to recover their investment when necessary. Loans, on the other hand, are private agreements between two parties and so cannot be traded. Creditors must pay the full amount to their debtors at agreed terms for principal and interest until they retire the loan.

The final classification of credit I reviewed is by Werner (2012). Werner distinguished between credit that used for GDP transactions (C_R) and credit that used for non-GDP transactions (C_F). C_R drives nominal growth in GDP while C_F drives asset transaction values that is, they are for providing collateral.

Sources of credit. Werner (2012) disaggregated credit into physical money and credit. Central banks create physical money by printing. Both the central bank

and commercial banks create credit money by making loans. Central banks require banks to reserve a percentage, R, of customers' deposits. Banks can then extend credit to households and firms up to 100-R percent of the deposited amount. However, a bank can make loans by increasing their reserves without receiving money from depositors. The power to extend credit based on the reserve requirements grants money creating abilities to banks. The import of this reserve requirements is that theoretically, researchers may estimate the quantity of credit that an economy can create from the total commercial bank reserves and the loans and bonds issued by the central bank.

Determinants of credit demand. The demand for credit (*D*) is in three parts. These are for household consumption (*C*), investment (*I*), and government borrowing, (*G*). Mathematically, the demand function is $D = C + I + G$. The major determinants of the demand for households and investors are, according to Herrera, Hurlin, and Zaki (2013), the level of economic activity, and the availability of alternative funding sources. The intensity of economic activity correlates positively with the demand while the presence of alternative funding has a negative relation with demand. The fraction of the budget deficit financed by domestic borrowing establishes the level of government demand for loans.

Determinants of credit supply. Banks supply credit to the market. The quantity of credit available for loans depends on the sources and uses of funds. Herrera et al. (2013) identified the sources as savings by households (*S*) dissaving or disinvestments (*Di*), and liquidity injection by central banks or government as part of a stimulus package (*Li*). The uses of funds by banks are for operational purposes (*B*), reserve requirements by central banks (*R*), and excess reserves by banks with the

central bank (*Re*). The sources have a positive effect on credit while the use of funds reduces the amount available. Mathematically, the supply function is $L = S + Di + Li - B - R - Re$, where the variables are as defined previously.

Theories on the demand and supply of credit. Two theories that explain the relationship between demand and supply are the neoclassical and the Keynesian. According to Lawson (2013), the basis of the neoclassical economic theory is the premise that free markets can regulate themselves if left alone, free of any human intervention. Therefore, the demand for credit will equal the supply. The neoclassical approach indicates that the intersection of the upward sloping supply curve of savings and downward sloping curve of demand for credit determines the cost of credit. As far as the theory goes, there is no external influence in the determination of the cost and quantity of funds available and requested--the so-called invisible hand ensures that the market clears and corrects itself in the long term.

A critique of the classical theory is that everything happens in the long term. As famously stated by Keynes (1936), ‘in the long run, we are all dead.' There is, therefore, the need to intervene in the short term to correct market imperfections and stimulate the economy. Monetary authorities, therefore, intervene regularly in the market to regulate the flow of funds. The intervention led to the evolution of the Keynesian loanable fund's theory which acknowledges the role of central banks in regulating the amount and cost of credit. The role of monetary authorities in the funds market includes the purchase and sale of government debt, revision of the reserve requirements, sale and acquisition of central bank bonds, and adjustments to the policy rates for interbank borrowing.

Both the neoclassical and Keynesian theories acknowledge the role of the interest rate as a clearing mechanism for the market. According to the neoclassical theory, the intersection of the upward sloping supply curve of savings and downward sloping demand curve determines the cost of credit represented by the interest rate. Higher interest rate increases the risk of bankruptcy. Therefore, firms facing an upward-sloping interest rate regime reduce their demand for loans.

Banks also, knowing that higher interest rates can attract risky investors, may restrain themselves from increasing interest rates beyond a certain level. Instead, they may ration credit and use their excess loanable funds to purchase government bonds and loans if the applicable interest rate ensured a minimum profit level for their operations.

The exception to the rule is the demand for credit by the government. Governments can borrow at any price but can also negotiate to borrow at concessional rates. These two conditions place governments in an advantageous position, and therefore they will not curtail their demand for credit at higher interest rates. The scenario of high-interest rate and strong demand for credit by the government can limit resources available and supplied by banks to the private sector. It can shift the supply of funds from the private sector to the public sector (Krishnamurthy & Vissing-Jorgensen, 2015) and financially crowd them out. Crowding out, therefore, results from increased government borrowing, higher interest rates, banks purchase of the public debt, credit rationing by banks, central bank reserves –both statutory and voluntary, and bank operating costs.

Models for Analyzing Financial Crowding Out

Investigating the incidence of FCO is a backward-looking process according to Guyton (2014). A fundamental assumption of this process is that past data can predict the future when used in the appropriate mathematical model. Coad (2007) stated that the adoption of a neoclassical theoretical base for research made possible the use of quantitative approaches in undertaking such investigations.

The purpose of quantitative research is to make generalizable conclusions about the subject of study. The results of such studies are useful for predicting the outcome of similar studies (Gippel, 2013). The quantitative process is deductive, enabled by the use of statistical models and large datasets. Deductive research according to Wayhuni (2012) follows a neoclassical and a rational expectations paradigm which derives from a positivist philosophy. Deductive research is scientific, driven by theory, seeks to confirm or falsify hypotheses, and contributes towards the generalization of results because they are replicable in similar contexts.

Scientific inquiry uses models to describe and explain the phenomena under study. Von Bertalanffy (1972) stated that the use of models finds application in everyday life and language. Finance researchers seek to explain, describe, and predict the performance of financial indicators and variables. Such research is mainly quantitative. Research in finance is a scientific inquiry and has benefited from the use of models. Qualitative methods also find application in finance research but, as noted by Kaczynski, Salmona, and Smith (2014), such methods are meant to supplement, or, serve as a prelude to the quantitative methods.

Nelder and Wedderburn (1972) popularized the use of models in their seminal work on the *Generalized Linear Models* (GLM). GLMs has three components: a

random element, which specifies the conditional distribution of the response variable; a linear predictor, that is, a linear function of regressors; and an invertible linearizing link function. The function transforms the expectation of the dependent variable to the linear predictor. GLMs adapts to varied applications.

Two specialized applications of GLM are multiple regression and correlation analysis. Johnson (2001) stated that both correlation and multiple regression are applicable in explanatory, descriptive, and predictive research. They also find application in the control of extraneous variables.

In finance research, one of the most common multiple regression methods is the ordinary least squares involving multiple independent variables and a dependent variable. The analysis yields explanations on which of several independent variables have a relationship, and the form of the relationship, with the dependent variable. Researchers use variants of the multiple regression analysis in reporting on FCO and other finance phenomena. Mahmoudzadeh et al. (2013) found four models, all adaptations of the multiple regression procedures, as the preferred methods for measuring FCO and other time series variables. These are the Vector Autoregression (VAR) model, the Error Correction Model (ECM), the Vector Error Correction Model (VECM) and One-Way Error Terms model. Researchers use these models in combination with time series data.

Other models in the literature include the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) family of models for forecasting the volatility of time series data. The GARCH models predict variance by utilizing the previous period's data in predicting the next period's outcome.

The Autoregressive Moving Average (ARMA) and the Autoregressive Integrated Moving Average (ARIMA) models are a class of stochastic processes used to analyze and to forecast using time series data. ARIMA models are a form of regression analysis. The models predict the future movements of seemingly random data series by examining the differences between values in the data instead of using the actual values. Lags of the differenced series are "autoregressive," and lags within forecasted data are "moving average". The model's specification is ARIMA (p, d, q), where the letters p, d, and q refer respectively to the autoregressive, integrated and moving average parts of the data set respectively. ARIMA modeling allows the analyst to account for trends, seasonality, cycles, errors, and non-stationary aspects of the data.

There is also the *Rule-Based Forecasting* model (RBF) which evolved out of the need to incorporate expert knowledge and judgment into the analyses and forecasting of time series data (Adya & Lusk, 2013). The RBF is thus an expert system that translates forecasting expertise into a set of rules that uses the analyst's knowledge and the characteristic of the data being analyzed to develop a model from a combination of simple extrapolation methods.

Model selection. Analysts adopt the model that most suit their data set and research objectives. Naa-Idar, Ayentimi, and Frimpong (2012) took a cointegration approach to study the determinants of private investments in Ghana for the period 1960 to 2010. They were able to analyze the 50-year period data because of the use of a time series model. Fayed (2013) similarly used a cointegration method to study the relationship between public borrowing and private credit. Mahmoudzadeh et al. (2013) on the other hand used the one-way error terms component of panel data in a

regression model to study the effect of fiscal spending and budget deficits on FCO in both developed and developing countries.

Model variables. Selecting variables to use in analyzing financial data is a combination of the model's requirements and availability. Data selection assumes that there is information on a large number of potential variables to sample for relevant variables for the preferred model. The second assumption is that data is accurate, unbiased, and adequate to make predictions and generalizations. Flannery and Hankins (2013) however, revealed the inaccuracy of these assumptions. They contended that analysts have to make approximations and adjustments to existing data to be able to analyze, make predictions, and propound theories.

The preceding can show the preponderance of variables used by different researchers in their analysis. Mahmoudzadeh et al. (2013) for example used private investment, the inflation rate, gross domestic product, government investment expenditure, government consumption expenditure, and deficit in their assessment of FCO. Fayed (2013), on the other hand, used private credit, government borrowing, the log of industrial production, the level of financial intermediation, the institutional quality, and the lending interest rate in analyzing the effect of FCO in Egypt.

Time selection. The purpose of my research is to investigate the presence of FCO in Ghana. It is an attempt to explain the effect of excessive government debt on interest rates and the quantity of private sector credit in Ghana. My research will span the period from 2006 to 2016. During this time, Ghana continued with economic and financial reforms under the aegis of the IMF and the World Bank. The country borrowed from both domestic and international banks to resuscitate the economy. The

period, therefore, defines the frame of reference for my data and is sufficient to provide the desired power and the effect size of my analysis.

Research Models

Quantity of Credit Model

I adopted Fayed (2013) approach for estimating the quantity of credit available to the private sector because my study location is in a developing country with fairly similar characteristics. I investigated the quantity of credit available to the private sector by using Equation 4:

$$PSCREDIT_t = \alpha_0 + \beta_1 DEBT_t + \beta_2 FINT_{t-1} + \beta_3 INSQUAL_t + \beta_4 TBRATE_t + \beta_5 GDP_t + \varepsilon_t \quad (4)$$

where:

PSCREDIT = private credit as a percentage of GDP,

DEBT = government debt as a percentage of GDP,

GDP = the log of GDP,

FINT = the level of financial intermediation,

INSQUAL = the institutional quality, and

TBRATE = the Treasury bill rate.

The subscript t is the time index.

The focus was on the parameter β_1. Crowding out of private credit by government borrowing implied that $\beta_1 < 0$. My set of control variables were the log of GDP, the level of financial intermediation measured by the ratio of total deposits comprising time and savings to the monetary base in the economy as defined by Rother (2001), and the degree of institutional quality. I used a one period lagged value of the financial sector deposits to allow for a positive response of deposits to a higher

interest rate in the current period. I used the institutional quality indicator (I), as an indicator of the quality governance in the economy. The World Bank reports the regulatory quality indicator as part of its worldwide governance indicators (WGI) report. The indicator reflects the perception of the government's ability to formulate and implement sound policies and regulations in support of private sector development.

Cost of Credit Model

Interest rates represent the cost of credit to borrowers. Banks also borrow and pay interest to depositors. The IRS, the difference between the lending and deposit interest rates charged by banks (Cull, Demirguc-Kunt, & Morduchp, 2014; Entrop et al., 2014; Gambacorta & Mistrulli, 2014) is the net gain to banks for their intermediation services. The IRS is, therefore, a measure of the cost of credit. There is, however, such a multiplicity of deposit and lending types, and applicable rates and conditions that the World Bank (2014) stated that there are limitations to their comparability across the board.

Ho and Saunders (1981) in their seminal paper on the determinants of bank interest margins, adopted NIM, the difference between the interest revenue and interest expense as reported by banks as their measure of interest rate spread. For a countrywide analysis, Mensah and Abor (2014) averaged all the interest margins by weighting with the total assets of each participating bank. The resulting average indicated the scale of interest margins in the country. Following their example, I adopted the NIM as my measure of the cost of credit.

Studies of the determinants of IRS yielded four sets of determinants- pure spread, bank operations, macroeconomic, and industry induced spreads (Ho &

Saunders, 1981). I advance the same arguments for the NIM. Therefore, following in the steps of earlier researchers such as Agca and Celasum (2012), Ho and Saunders (1981), Mensah and Abor (2014), and Sharpe (2012), I adopted an econometric model for my research. The model included all the four determinants of the NIM in the form stated in Equation 5:

$$NIM = f\{industry\ variables;\ macroeconomic\ variables;\ bank\text{-}specific\ variables\} \quad (5)$$

My dependent variable was the cost of credit represented by the NIM. The independent variable was the government's domestic debt expressed as a ratio of domestic public debt to GDP. Macroeconomic variables, bank-specific variables, and industry variables served as my covariates. I lagged the regression terms for government debt to account for their delayed effect on the economy.

Following Agca and Celasun (2012) but replacing IRS with NIM, and eliminating all variables related to foreign debt, I examined the incidence of changes in the cost of credit to the private sector by Equation 6:

$$NIM_t = \alpha_0 + \alpha_1 Debt_{t-1} + \alpha_2 X_t + \alpha_3 Y_t + \alpha_4 L_t + \varepsilon_t \quad (6)$$

where

NIM_t = net interest income as a ratio of total bank assets in year *t*,

α_0 = the pure spread, obtained by the regression intercept

$DEBT_{t-1}$ = lagged ratio of domestic public debt to GDP,

X_t = a vector of macroeconomic variables for the country in year *t* including inflation, budget deficit, exchange rate,

Y_t = a vector of bank operational variables (including information on bank size, efficiency, and risks for all banks in the country for year *t*,

L_t = a vector of industry characteristics, including the level of competition and regulations

ε_t = error term.

The effect of government debt is likely to lag the cost of credit. I, therefore, lagged the regression terms for the public debt by one period to account for their expected delayed effect.

Summary and Conclusions

In this chapter, I presented the state of the literature on the theory of FCO. I began the chapter by discussing my approach to the literature review. I continued with an introduction and discussion of the theory and literature behind the phenomenon of FCO. I discussed the determinants, operations, indicators, and the means of assessing the existence of FCO in an economy.

Bernheim (1989) asserted that researchers do not seem to agree on the FCO concept. One of the major points of departure related to economic geography. Developed economies experience minimal levels of FCO due to economic integration and their ability to trade government debt across borders. In developing economies, government debt may induce FCO, but additional factors such as macroeconomic conditions and banking industry factors may be influential as well. Fayed (2013) found long-term financial crowd-in in Egypt; whereas, Asogwa and Okeke (2013) found that public investment crowded out private investments in Nigeria. These findings are supportive but not necessarily applicable to Ghana. My research extended

knowledge in this area by showing that FCO existed in the Ghanaian economy where public debt is a significant proportion of bank assets.

In the next chapter, I develop and justify my methodology for studying FCO in Ghana based on available data and my research questions. I also discuss my data sources and collection methods. I identify the limitations and threats to data collection and analysis and discuss the strategies to minimize their impact on my research.

Chapter 3: Research Method

The purpose of this quantitative research was to investigate the presence of FCO in Ghana. I did this by examining the relationship between government domestic debt and credit advanced to the private corporate sector by Ghanaian banks. I used the results to determine whether the government crowded out the private sector regarding the quantity of credit, the cost of credit, or both, to confirm the presence of FCO in Ghana.

In this chapter, I discuss my research design and the rationale behind it. I also discuss my research philosophy, the theoretical basis, and my choice of analytical method. I define and operationalize my research variables and present a detailed methodology for the study. In the method section, I identify my research population and the sampling methods that I used. I also discuss my data analysis plan and my strategies to mitigate any threats to the internal and external validities of the research. I conclude the chapter with a summary and provide a transition to the next chapter.

Research Design and Rationale

In this research, I tested two hypotheses related to FCO. The first hypothesis related to the quantity of private sector credit, whereas the second hypothesis related to the cost of credit. The dependent variable for the first hypothesis was the quantity of private sector credit. The independent variable was domestic government debt. The covariates were the GDP, the level of financial intermediation, the institutional quality, and the treasury bill rate. In testing the second hypothesis, the dependent variable was the cost of credit operationalized as the NIM. The independent variable was the government's domestic debt. The covariates were annual inflation, the annual budget deficit, the exchange rate (i.e., Ghana cedi to US dollar), the size of the

banking industry, bank efficiency, bank risks, Herfindahl-Hirschman index, bank concentration, and the regulatory quality index.

The research design was quantitative. I classified it as explanatory and correlational. Explanatory research describes the relationship between variables (Vogt, 2011), whereas correlational research explores causation and association between the research variables (Chen & Krauss, 2011).

Research Philosophy and Theoretical Base

I grounded my study in the positivist philosophy as per the classification of Wahyuni (2012). In positivism, reality is external, objective, and independent of the researcher. Positivists also focus on fact-based causality and generalizations, and value-free interpretation of results. The positivist philosophy thus suited my research in which I analyzed and based my conclusions on data procured and stored by the BoG and the World Bank, two objective and independent institutions. By its nature, the positivist approach is quantitative, which justified my design. Other research philosophies such as postpositivism, interpretivism, and pragmatism are value-laden, and interpretation of data depends on the researcher. The results of such research approaches are not generalizable to other jurisdictions and did not serve my purpose in this study.

I based my research on the neoclassical theory of FCO. Lawson (2013) stated that the neoclassical approach allows the researcher to adopt rigid mathematical formulae and models to test his or her hypothesis. The use of mathematical formulae makes the research replicable in similar circumstances, thus giving it a distinct advantage over qualitative methods. According to Coad (2007), neoclassical theorists have developed an impressive set of mathematical models that enable an objective test

of theories. Researchers in economics and finance prefer these models because they yield results that can inform public policy in support of a positive social change.

Choice of Analytic Method

I adopted multiple regression data analytic process in my research consistent with previous similar research including studies by Fayed (2013), Mahmoudzadeh et al. (2013), and Sharpe (2013). Another quantitative method that I could have used was correlations. Correlations estimate the strength and the direction of the association between pairs of data. Correlation, however, does not infer causality; that is, I could not use it to explain whether the changes in the independent variable caused changes in the dependent variable (Chen & Krauss, 2011). Correlations also cannot be used to process data with multiple independent variables, rendering them unsuitable for my research in which I used one independent variable, one dependent variable, and several covariates.

I used time series data consistent with Fayed (2013), who stated that measuring the crowding out effect of government borrowing requires the use of data through an extended period. Time series data can be regression analyzed, after data cleaning and transformation, to test hypotheses and draw conclusions.

My data consisted of the total outstanding measurement of the variables instead of periodic changes. The approach was consistent with Bernheim's (1989) advice that the neoclassicist should focus on the total outstanding measure of the variables under study instead of the changes that occurred between periods. The objective is to provide a more informed measurement and effect of the independent variables on the dependent variables.

Methodology

Population

The research population comprises the 802 financial sector operators listed in the 2016 Annual Report of the BoG (Bank of Ghana, 2017). They comprised 33 DMBs, 64 NBFIs, 141 RCBs, and 564 microfinance institutions (MFIs). The list formed the frame of reference for the financial institutions whose data I used. I sampled participants from this population of financial institutions who purchase government debt in its various forms.

Sampling and Sampling Procedures

My research involved a two-stage sampling approach. The first was to sample the number of financial institutions to participate in the study. The second was the number of periods of data used in the analysis. The second sampling arose because of my use of time series data. I had to specify the length of data I used, which introduced the second set of sampling required.

Sampling the number of financial institutions. My data sources were the Bank of Ghana and the World Bank's world governance database. I limited my sample to the commercial banks, also referred to as DMBs, because their asset value constituted 85.6% of all the Ghanaian financial institutions in 2016 (Bank of Ghana, 2017). They, therefore, represent a significant size of the financial sector of the Ghanaian economy.

Sampling the duration of research data. Determining the size of the sample involved first estimating the power and effect size and then using the result to determine the extent of data required for the study.

Power estimation. The power of a test measures the ability of the analysis to reject the null hypothesis when it is false (Coffey, 2010). I, therefore, chose a sample size that ensured adequate power for my research findings. The basis of power analysis is the *F* distribution. The power of research findings is a function of the significant level of the test, α; the number of explanatory variables, m; the effect size, f; and the sample size, n.

Ioannidis, Stanley, and Doucouliagos (2015) stated that researchers in economics and finance have no preferred power for their analysis. According to McCloskey (1985), these researchers routinely ignore the advice of statisticians to estimate the power of their analyses because they prefer substantive to statistical significance in their studies. Such scientists seem to adopt the maxim of Kelley and Maxwell (2003) that sample sizing must aim at obtaining accurate and not just statistically significant results. In the absence of accepted practice, researchers adopt the general methods of others in their disciplines. I adopted Coffey's (2010) recommendation of power level of between 80% and 90% for estimating the size of the sample in my research.

Effect size. Effect size is the nonscalar measure of the strength of the relationship between variables (Maher, Markey, & Ebert-May, 2013). Effect size and statistical significance testing are complementary, and both are necessary when evaluating research findings. Different effect size measures exist for various research objectives. In my research, I used multiple regression data analysis processes to investigate whether my independent variable and covariates jointly explain the variation in the dependent variable. Maher et al. (2013) recommended that the right effect size measure for such research be the coefficient of multiple determination, R^2.

R^2 explains how much of the variation in the dependent variable resulted from changes in the independent variables. I preferred as strong a relationship as possible to ensure significant research findings.

The relationship between effect size and R^2 was given by Zaiontz (2016) in Equation 7:

$$R^2 = f^2(1 + f^2)^{-1} \quad (7)$$

where:

R^2 = coefficient of multiple determination, and

f^2 = the effect size measure

I observed that finance and econometric research did not specify effect sizes. Durlak (2009) advised that under such circumstances, researchers could adopt Cohen (1988) recommended effect sizes. By this recommendation, I selected a medium effect size of 0.15 for estimating my sample size. The choice of 0.15 effect size resulted in an R^2 of 0.13 which was the minimum value to assure adequate power for the findings of the research.

Estimating the sample size. Using any three of the four variables: the significant level of the test, α; the number of explanatory variables, *m*; the effect size, f^2; and the sample size, *n;* the analyst can estimate the fourth by employing an appropriate test. I adopted the methodology used by the G*Power software to estimate the sample size I needed for each research question. I summarized the results of the G*Power analysis of the determination of my sample size in Table 1.

Table 1

Sample Size Selection

	Number of predictor variables	Effect size, f	Significant level, α	Assumed power	Sample size, n	Periods of data available
Research Question 1	5	0.15	0.05	0.8	82	131
				0.9	123	131
Research Question 2	9	0.15	0.05	0.8	101	131
				0.9	125	131

By the results shown in Table 1, I needed a maximum of 82 periods of data to answer Question 1 and 101 periods data to answer Question 2 assuming a power of 0.8, and 123 and 121 respectively for an assumed power of 0.9. The BoG provided monthly data for the period February 2006 to December 2016 which yielded a sample size of 131. I, therefore, adopted a power of 0.9 and a sample size of 131 for both questions. The larger sample size would result in a higher explanatory power for the findings of my research.

Archival Data

I followed Walden University's procedure for data collection. I obtained approval to collect data from Walden University's Institutional Review Board (IRB). The IRB approval is a prerequisite for data collection designed to ensure that researchers adopt ethical standards and comply with US federal regulations.

I employed secondary data for my research. I sourced my data from the Bank of Ghana and the World Bank databases. These are open source databases available to the public. Data on some variables were not publicly available on the BoGs website. The BoG considers data from individual banks sensitive and will only release them in

an anonymized format to prevent users tracing their source. I wrote to request such processed data from the BoG.

Definition and operationalization of research variables. I measured two key variables that explained the incidence of FCO in my research. These are the quantity of private sector credit measured as a percentage of total loans, and the cost of credit represented by the NIM and measured as a percentage of GDP. The two variables were key indicators of the potential use of debt by firms and served as my dependent variables.

Quantity of credit variables. I adopted Djankov et al. (2007) and Fayed (2013) approach for estimating the quantity of credit available to the private sector. I investigated the quantity of credit available using Equation 8:

$$PSCREDIT_t = \alpha_0 + \beta_1 DEBT_t + \beta_2 FINT_{t-1} + \beta_3 INSQUAL_t + \beta_4 TBRATE_t + \beta_5 GDP_t + \varepsilon_t \quad (8)$$

I have summarized the model's variables, their operational definition, and sources in the following sections:

1. *Private Sector Credit* (*PSCREDIT*)*:* PSCREDIT is the dependent variable in the model. It refers to financial resources provided to the private sector by deposit-taking companies (i.e., banks, except the central bank). Financial resources include loans, purchases of nonequity securities, trade credits, and other accounts receivable that establish a claim for repayment, measured as *private credit as a percentage of total credit.* The Bank of Ghana provided financial statements of individual banks from which I extracted data for this variable.

2. *Government Debt* (*DEBT*)*: DEBT* was the government's domestic public debt outstanding measured as the ratio of *government domestic debt to total credit in percentage.* DEBT is the entire stock of direct government fixed-term contractual obligations to others outstanding on a particular date. It comprises loans and credit advanced by commercial banks to the central government, government ministries, departments, and agencies, and government corporations. It also includes treasury bill purchases of the central bank and bonds issued in the domestic market by the government and the central bank. It is the gross amount of government liabilities to the banks reduced by the amount of equity and financial derivatives held by the government. Debt is a stock rather than a flow, measured as of a given date, usually the last day of the reporting period. The data I used in the model was the total debt outstanding at the end of the reporting period divided by the total credit. I collated and summarized the data from the balance sheet of individual banks.
3. *Gross Domestic Product* (*GDP*)*:* GDP measured at purchaser's prices is the sum of the gross value added by all resident producers in the economy plus any product taxes minus any subsidies not included in the value of the products. Data are in current Ghana cedi. I transformed the GDP of the country by a log function in the model. I sourced GDP data from the BoG.
4. *The level of financial intermediation* (*FINT*)*:* FINT is the ratio of total deposits, comprising time and savings, to the monetary base (M2) in

the economy. Rother (2001) defined the variable. The Bank of Ghana provided financial statements of individual banks from which I extracted data for this variable.

5. *Institutional Quality* (*INSQUAL*)*:* INSQUAL captures the perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The estimate gives a country's score on the aggregate indicator, in units of a standard normal distribution (i.e., ranging from approximately -2.5 to 2.5). The definition and estimate were by Kaufmann et al. (2010). I sourced INSQUAL data from the World Bank's world development indicators database at https://worldbank.org/indicators.
6. *The treasury bill rate (TBRATE):* A treasury bill is a short-term investment product ranging in duration from 91 days to 365 days and which the BoG sells on behalf of the Government. In the research, I used the average monthly rate for the 91-day treasury bills I sourced from the Bank of Ghana.
7. *Time Index (t):* The time index was monthly to conform to the format of the data I used in the model. Time was not a research variable.

***Cost of credit variables*.** Following Agca and Celasun (2012), but replacing interest rate spread with net interest margin, and eliminating all variables related to foreign debt, I examined the incidence of changes in the cost of credit by Equation 9:

$$NIM_t = \alpha_0 + \alpha_1 DEBT_{t-1} - \alpha_2 DEF_t + \alpha_3 EXCHR_t + \alpha_4 INFL_t + \alpha_5 RISK_t + \alpha_6 CONCEN_t + \alpha_7 EFF_t + \alpha_8 SIZE_t + \alpha_9 HHI + \alpha_{10} RQUAL_t + \varepsilon_t \quad (9)$$

I summarized the model's variables, their operational definition, and source in the following sections:

1. *Net Interest Margin* (*NIM*)*:* NIM represents the cost of credit, the dependent variable in the model. NIM is the accounting value of net interest income (NII) as a ratio of total assets. I estimated this variable from the financial statements of Ghanaian banks made available by the BoG. The BoG data reports NII cumulatively from the beginning of each financial year. I subtracted the preceding months' data from the current month to obtain the net for each month for the periods February to December. January figures were net.
2. *The pure spread* (α_0)*:* The pure spread is the banks' margin due to transactions uncertainty (Ho & Saunders, 1981). The variable is the regression intercept in the model.
3. *Government domestic debt* (*DEBT*)*:* DEBT refers to public debt defined as the outstanding government debt owed to domestic lenders. The variable used in the model was the ratio of domestic government debt to GDP following Agca and Celasun (2012). The Bank of Ghana provided financial statements of individual banks from which I extracted data for this variable.
4. *Inflation* (*INF*). INF is a measure of periodic changes in the consumer price index (CPI). The model used the monthly average rate of inflation expressed in percent. The BoG provided the INF.

5. *Annual budget deficit* (*DEF*)*:* DEF is the annual budget deficit of the government measured as a percentage of GDP. The BoG provided the data.
6. *Exchange Rate* (*EXCHR*)*:* EXCHR is the official exchange rate calculated as monthly average based on daily averages of local currency units relative to the U.S. dollar. EXCHR data was available from the Bank of Ghana.
7. *Bank Size* (*SIZE*)*:* SIZE is the total assets of commercial banks as a ratio of GDP. Assets included claims on the whole nonfinancial real sector, including government, public enterprises, and the private sector. I extracted the variable from the financial statements of individual banks made available by the BoG.
8. *Bank efficiency* (*EFF*)*: EFF* is the ratio of overhead costs to total assets, defined as the accounting value of a bank's overhead costs as a share of its total assets in percent. I estimated the data from the financial statements of individual banks made available by the BoG.
9. *Bank risks* (*RISK*)*:* RISK is the ratio of loans-to-total assets, defined as the proportion of all outstanding loans-to-total assets measured in percent at the end of the period. I estimated the variable from the financial statements of individual banks made available by the BoG.
10. *Herfindahl-Hirschman Index (HHI):* The HHI measures the level of competition in the banking industry. Lijesen et al., (2002) defined the HHI as the sum of squared of market shares of all firms in the market. I

estimated the HHI using the total assets data from individual bank financial statements made available by the Bank of Ghana.

11. *Bank Concentration* (*CONCEN*)*:* CONCEN measures the assets of the three largest banks as a share of assets of all DMBs in the country expressed in percent. I estimated the variable using the total assets data from individual bank financial statements made available by the Bank of Ghana.
12. *Regulatory Quality Index* (*RQUAL*)*:* RQUAL captures the perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution (i.e., ranging from approximately -2.5 to 2.5). The data was available at World Bank's Worldwide Governance Indicators website.
13. *Time Index* (*t*)*:* The time index was monthly to conform to the format of the data I used in the model. Time was not a research variable.

Data Analysis Plan

I used IBM's Statistical Package for Social Scientists software (IBM, 2015) also known simply as SPSS, the statistical software package known as EViews, and the Microsoft Excel software package to analyze my data. The SPSS software can perform some of the statistical analysis I envisaged. The software also has the capabilities to import data from other sources including Microsoft Excel, which improved on its versatility as an analysis tool. However, SPSS had limitations when applied to dynamic econometric data, and so I employed EViews to perform some of

my analysis. I used the Microsoft Excel software to collate my data before I exported them to SPSS and EViews for analysis.

In this section, I described the methods I used to clean and screen my data and to check for the independence of the variables. I also restated my research questions and each of the hypotheses I tested. In the final part of this section, I presented a detailed plan for analyzing each of the research questions.

Data Cleaning and Screening

My first action on acquiring the data was to screen and clean it. The screening took the form of visual inspection to find duplicates, missing data, outliers, and mistakes. There were no duplicate data entries, but some data were missing, and others were obvious mistakes. I drew the attention of the BoG to obvious mistakes and subsequently received corrected data. Three months data entries were completely missing. I determined that the loss was random. I resolved the missing data by replacement using interpolation between adjacent values and by assuming linearity of the variable within that space.

Data transformation. Regression models assume linearity of the variables employed. However, all the variables may not obey the rule. Data may be present in different scales and dimensions and would require transformation to be useful in a model. Roberts (2008) explained that transforming data involves applying a non-linear operator to the data and analyzing the resulting data instead of the raw data. The transforms could be a logarithm, reciprocal, or root. Negative data can be converted into a logarithm form by the addition of a constant to convert to a positive value before transformation. From Table 2 and

Table 3, all of the models' variables are in the range of zero to thousands. The exception is the GDP data which were in millions. Following from Roberts (2008), I transformed my GDP variable using the logarithmic transformation as indicated in Table 2. The other variables required no transformation.

Table 2

Transformed Variables of Research Question 1

Variable	Description	Dimension	Order of magnitude	Transform
PSCREDIT	Private credit as a percentage of GDP	%	%, max 100	None
DEBT	Government domestic debt as a percentage of GDP	%	%, max 100	None
GDP	GDP	$	10^6	Logarithm
FINT	Level of financial intermediation	%	%, max 100	None
INSQUAL	Institutional quality	Units of a standard normal distribution	-2.5 to 2.5	None
TBRATE	Treasury bill rate	%	Max 100	None
t	Time index	Year	Units	None

Table 3

Transformed Variables of Research Question 2

Variable	Description	Dimension	Order of magnitude	Transform
NIM	Net interest margin	%	Max 100	None
α_0	Pure spread	Depends on the measure of the NIM	Related to NIM	None
INF	Inflation	%	Max 100	None
DEBT	Ratio of government debt to GDP	%	Max 100	None
DEF	Ratio of annual budget deficit to GDP	%	Max 100	None
EXCHR	Exchange rate	¢/$	Units	None
SIZE	Bank size	%	Max 100	None
EFF	Bank efficiency	%	Max 100	None
RISK	Bank risks	%	Max 100	None
HHI	Level of competition	% squared	Thousands	None
CONCEN	Bank concentration	%	Max 100	None
RQUAL	Regulations	Units of a standard normal distribution	-2.5 to 2.5	None

Data Analysis Process

Descriptive statistics. The first set of analysis I performed was a descriptive analysis of my research data. I reported on the mean, median, standard deviation, the skew, and kurtosis of the data. I also inspected the data graphically to check the presence of outliers (Field, 2013).

Check for normality of data. Ordinary least squares regression assumes normality of the data employed. Normally distributed data make possible the application of standard statistical methods to analyze the data. Three models for

testing the normality of data are the Kolmogorov-Smirnov (K-S) test for non-parametric data, the Shapiro-Wilk (S-W) for continuous variables, and the Jacque-Bera (J-B) which tests whether a sample data had the skewness and kurtosis to qualify as a normally distributed data. I checked for the normality of my research data using the J-B method. The test rejects a J-B statistic greater than 5.5 for normality.

Solutions to normality violations include converting the data, or the researcher may elect to use non-parametric analytic methods. However, I adhered to Field's (2013, p 184) caution that in large samples, researchers need not worry about normality as results are likely to be significant. I chose to ignore the non-normal distribution exhibited by some of my research variables.

Check for multicollinearity. I checked for multicollinearity between the variables by estimating the correlation coefficient between pairs of variables. Models with more than one predictor shall not have significant correlations between any pair of the predictors (Field, 2013, p. 132). Correlation coefficients greater than 0.90 indicates the presence of collinearity. The solution to collinearity is to remove one of the predictor variables and so I eliminated one of the two collinear variables from the dataset in the model.

Check for stationarity. Ordinary least squares regression method analyzes and produces efficient estimates when the data is stationary (Beck, 2004) A stationary time series has a constant mean, variance, and autocorrelation over time. Researchers assess stationarity of a time series by examining the coefficient of regression of a series on its first lag. The three tests for checking stationarity status of research data are the Dickey-Fuller (DF), the augmented Dickey-Fuller (ADF), and the bounds test. The DF test checks whether a time series data has autoregressive properties.

Researchers perform by regressing the variable over its first lag and examining the estimate of the coefficient of regression. In general, we test if the following property of Equation 10 holds:

$$x_t - x_{t\text{-}1} = \alpha_0 + \delta x_{t\text{-}1} + \mu_t \quad (10)$$

The hypothesis test is to reject the null when $\partial \neq 0$, and assume unit roots.

The ADF method introduced three variations to the model as follows in Equations 11, 12, and 13:

- no constant, no trend: $\Delta x_t = \delta x_{t\text{-}1} + \Sigma^n_{i=1}\alpha_i \Delta x_{t\text{-}i} + \varepsilon_t$ (11)
- constant, no trend: $\Delta x_t = \alpha + \delta x_{t\text{-}1} + \Sigma^n_{i=1}\alpha_i \Delta x_{t\text{-}i} + \nu_t$ (12)
- constant and trend: $\Delta x_t = \alpha + \delta x_{t\text{-}1} + \gamma_t + \Sigma^n_{i=1}\alpha_i \Delta x_{t\text{-}i} + \nu_t$ (13)

where the parameters α denotes a non-zero constant, γ_t is a deterministic time trend, and v_t represents the residuals generated by the test. The parameter *i* is the lagged term of each variable, $x_{t\text{-}i}$ represents the *ith* lagged term of the variable, t = 1, 2, 3, …., n, and n is the dimension of the vector variable. Equation 11 denotes a stationary time series with no intercept and trend when the null is rejected; Equation 12 denotes a stationary time series with an intercept but no time trend implying that x_t is stationary with a nonzero mean when the null is rejected; Equation 13 includes an intercept and a time trend, implying that x_t is a stationary series around a deterministic trend when the null is rejected.

To run the ADF test, the researcher must decide the number of lags to apply to the model by the vector auto-regression method. The length of the lag shall be such that there is no serial correlation between the residuals. The options for selection are to minimize Akaike's information criterion (AIC) or the Bayesian information criterion (BIC) or drop lags until the last lag is statistically significant.

The bounds test developed by Pesaran, Shin, and Smith (2001) determines if there is a level relationship between a dependent variable and a set of regressors when it is not known with certainty whether the underlying regressors are stationary in levels or first difference. An *F* statistic greater than the critical I(0) value implied a short run relationship while a statistic greater than the critical I(1) value indicated a long run relationship. An F statistics between I(0) and I(1) returns an indeterminate situation. The Bounds test was available in the EViews software. According to Pesaran et al. (2001), the unrestricted ECM must be dynamically stable based on its autoregressive structure and errors must be serially independent. When these conditions are satisfied, a bounds test can be conducted to determine whether there is a long run relationship between the variables.

Performing the regression. The test of stationarity can yield four different results: the variables are stationary in levels; the variables are stationary in first difference but not cointegrated; the variables are stationary in first difference and cointegrated; the variables are a mix of I(0) and I(1).

Where the variables were stationary in levels, that is, they were I(0), I performed the regression model to establish the relationship between the variables using the ordinary least squares (OLS) method. Where the variables were stationary in first difference, that is, they were I(1), but not cointegrated, I modeled the regression using their differenced variables in an OLS method. Where the variables were stationary in first difference and cointegrated, I used the Johansen cointegration method to establish a cointegrating relationship between the variables. The cointegration method developed by Johansen and Juselius (1990) uses the multivariate maximum likelihood test to determine the number of cointegrating equations.

Researchers use the test to establish if there was a linear combination of the dependent and independent variables that results in a stationary model, Equation 14:

$$Y_t + \gamma_1 X_{1,t} + \gamma_2 X_{2,t} + \ldots + \gamma_k X_{k,t} \sim I(0) \quad (14)$$

where Y_t is the dependent variable, and X_{kt}s are the independent variables.

The Johansen test has two forms--the trace test and the maximum eigenvalue test. In the trace test, we test for the number of linear combinations (K) to be equal to a given value K_o and the alternative hypothesis for K to be greater than K_o, that is, H_o: $K = K_o$; and H_1: $K > K_o$. The test sets $K_o = 0$, for no cointegration and attempt to reject the null hypothesis to confirm the existence of at least one cointegration relationship.

The maximum eigenvalue test examines the relations H_o: $K = K_o$ and H_1: $K = K_o + 1$. By rejecting the null hypothesis, we could infer that there was only one cointegrating relationship between the variables.

After establishing the stationarity and cointegration status of the series at some combination, researchers use a vector error correction model (VECM) to estimate the cointegrating equation. The VECM combines the Vector Autoregression (VAR) and the cointegration results. Niyimbanira (2013) described the ECM as an estimate of the linear transformation of an autoregressive lag model. The ECM model is the Equation 15:

$$N\Delta y_t = M\Delta x_t + \alpha(y_{t-1} - \beta_0 - \beta_1 x_{t-1}) + \varepsilon_t \quad (15)$$

where N, M are vectors of the dependent and independent variable respectively. The regression equation yields the parameter, α, of the error variable which describes how quickly the model returns to equilibrium. For the model to return to its long-run equilibrium position after drifting, α must be negative and less than one. I used the model to describe the short run impact of the independent variables on

the dependent variable. Where my variables exhibited a mix of I(0) and I(1), Perasan and Shin (1999) proposed the autoregressive distributed lag (ARDL) approach to finding a cointegration relationship between the variables.

The ARDL method formulates an unrestricted ECM with an appropriate lag structure for each variable. The BIC or the AIC determines the lag structure. In the EViews software, determining the lag structure can be automated such that the software determines the optimal lag length for each variable. The key assumption of the ARDL method is that the errors of the unrestricted ECM are not serially correlated.

The ARDL methodology has some advantages over the traditional cointegrating model. These include application in a mix I(0) and I(1) data; a single-equation set-up, making it simple to implement and interpret; and differing lag lengths for each of the model's variables. The model is autoregressive because the lagged values of the dependent variable explain part of variable's values.

The basic ARDL regression model is of the form in Equation 16:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \ldots + \beta_p y_{t-p} + \alpha_0 xt + \alpha_1 x_{t-1} + \ldots + \alpha_q x_{t-q} + \varepsilon_t \quad (16)$$

where εt is an error term.

The ADRL model generates the long run relationship between the research variables. The model also generates the short run cointegrating model which specifies how fast the model returns to its long-run equilibrium state after a drift. The short-run equation of the ADRL method uses the first differences of the regression variables.

Tests of Residuals

Following from the ADRL analysis, I performed tests on the residuals. These tests were to satisfy the requirement that results were best linear unbiased estimates

(BLUE) and could explain the relationship between the dependent and independent variables in the model. I checked for outliers, serial correlation, and heteroscedasticity of the residuals.

Check for outliers. Observations or data which lie outside a specified region of a dataset qualify as outliers (Ben-Gal, 2005). Outliers may be univariate affecting one variable only or multivariate, affecting multiple variables simultaneously. Outliers can be peculiar observations, the result of mistakes in data entry, or sampling error. Baragona and Battaglia (2007) stated that compared with random samples, time series outliers may not always be the largest or smallest records. They may be outliers because they are inconsistent with adjacent data entries. Their presence can affect the statistics by introducing bias in estimated parameters, the wrong specification of research models, or incorrect research results (Ben-Gal, 2005; Field, 2013). Detecting outliers are to identify data that lie in the defined outlier region using distance-based methods. Distance-based methods measure an observation from a reference parameter usually the mean, median, or the trend line. The method identifies an observation as an outlier when it lies beyond a specified distance from the reference.

A scatter plot, a box plot, or a histogram of the data can reveal the presence of outliers in univariate data and some multivariate data (Field, 2013). However, for some data, graphical methods may not necessarily unearth outliers, and researchers must rely on non-graphical methods to detect such outliers (Baragona & Battaglia, 2007). Among the non-graphical methods are the z-score approach, the Mahalanobis distance (MD) approach, the Cooks' distance (CD) approach, and the *median absolute deviation* (MAD) method of Leys, Ley, Klein, Bernard, and Licata (2013). The authors argued that all the methods except the MAD included the outlier(s) in the

estimation of the mean and the standard deviation. The resulting statistic is, therefore, biased and may not properly identify the outlier(s). The MAD method uses the median observation of the data as a reference and therefore presents an unbiased determination of outliers. The MAD method is most suitable for univariate data.

The MD is a measure of the distance between populations (Vogt, 2011). It is one of the most used test methods for investigating the presence of multivariate outliers. Researchers also use the MD to test the assumption of homogeneity of variance. The measure considers the variance and covariance between variables. It measures the distance of the predictor data entries from their means. According to Field (2013, p. 307), these measurements follow a chi-square distribution with the degree of freedom equal to the number of predictors in the model. A cut-off point, established by specifying the desired alpha level, indicates which cases are outliers. In my research, I used an alpha level of 0.05 (i.e., $p = 0.05$) to determine my cut-off points.

CD measures influential cases in the regression model (Stevens, 1984) by assessing the changes in the regression coefficient with a case omitted. It is an outlier measure which examines the joint effect of a case on both the predictor and dependent variables. The distance, CD, is given by Equation 17:

$$CDi = (p + 1)^{-1} r_i^2 hii \quad (17)$$

where r_i is the standardized residual, and h_{ii} is the hat element. A CD value greater that one is large and warrant further examination of the data (Field, 2013, p 306). The solution to large CDs is to examine the case for validity, omitting the case, including additional data points to improve the estimation, and investigating the data set to see whether more data points would be required.

I adopted the non-graphical methods recommended by Baragona and Battaglia (2007) to check for outliers. I used the MD method to check the presence of outliers and the CD method to check for influential cases. Together, I was able to make informed decisions on the status of my residuals.

Check for serial correlation. Serial correlation occurred when the residual terms of any two variables were correlated, also referred to as autocorrelation (Field, 2013, p. 311). The presence of serial correlation violated the assumption of independence and identical distribution of variables and rendered the results of significance tests and confidence intervals invalid. The Durbin-Watson (DW), the Breuch-Godfrey LM, and the Durbin's h tests test for serial correlation.

The DW statistics tests for the presence of serial correlation among variables. It tests the null hypothesis that residuals of an OLS regression are not autocorrelated. The alternative hypothesis is that they follow an auto-regression (AR1) process. The DW statistics range in value from zero to four. As a rule of thumb, values close to zero means a positive autocorrelation while a value close to four implies a negative autocorrelation, with values near two implying no autocorrelation. Lagged values of the dependent variable on the right-hand side of the equation violates the assumptions of the DW test making it unfit for use to test serial correlations. In such instances the Breusch-Godfrey LM test or Durbin's h-test were appropriate.

The Breusch-Godfrey's LM test tests for higher order regressions while the Durbin's h-test applied to AR(1) models only. I therefore chose and checked for serial correlation using the Breusch-Godfrey method.

The Breusch-Godfrey LM test stated that if by Equation 18:

$$y_t = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta k x_k + \mu_t \qquad (18)$$

where μ_t is given by Equation 19:

$$\mu t = \rho_1 \mu_{t-1} + \rho_2 \mu_{t-2} + \ldots + \rho_n \mu_{t-n} + \varepsilon t \quad (19)$$

then combine Equations 18 and 19 into Equation 20:

$$yt = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \rho_1 \mu_{t-1} + \rho_2 \mu_{t-2} + \ldots + \rho_n \mu_{t-n} + \varepsilon_t \quad (20)$$

and test the null hypothesis H_0: $\rho_1 = \rho_2 = \ldots = \rho_n = 0$ (i.e., no serial correlation in the residuals against the alternative hypothesis H_a: at least one of the ρ_s is not zero, implying there is serial correlation).

Check for homoscedasticity. Homoscedasticity is a necessary condition for performing an OLS. Homoscedasticity assumes that variability in the residual scores of one continuous variable is roughly the same at all values of another continuous variable (Field, 2013). Homoscedasticity simplifies the OLS estimation techniques, leads to an unbiased and efficient OLS estimates, allows hypothesis testing, and the construction of confidence intervals and variances of coefficients in regression models.

Homoscedasticity is verifiable by visual inspection of the graphical plot of the residuals with the independent variable. Breusch and Pagan (1979), White (1980), and Perasan et al. (1980) provided methods to test whether the variance of errors from a regression correlated with the independent values. These tests are chi-square tests with k-degrees of freedom. A test return of $p < 0.05$ rejects the null hypothesis of homoscedasticity and assumes heteroscedasticity of variance. The Breusch-Pagan method tests for homoscedasticity where data is assumed to be parametric. The White method tests for both heteroscedasticity and model misspecification and applies to non-parametric data. The Perasan et al. (1980) bounds test tests for heteroscedasticity

when the variables are a mix of I(0) and I(1). I have described the bounds test in another section of this dissertation.

Both the Breusch-Pagan and the White tests for heteroscedasticity are not available in SPSS. The White test can, however, be performed indirectly in SPSS. I used the EViews software for the Breusch-Pagan test. I based my choice of method on the results of the normality test of the data which exhibited both I(0) and I(1) characteristics.

Heteroscedasticity does not result in biased parameter estimates, but its presence means that the OLS does not provide the estimate with the least variance. It may also produce biased standard errors but may not affect significance tests. The solution to heteroscedasticity is data transformation. The Box-Cox transformation (Box & Cox, 1964), lists three common types of transformations: power transformation, used when there is moderate skewness or deviation; logarithm transformation used when there is substantial skewness or deviation; and data inversion, used for extreme skewness or deviation cases. Their test estimates a lambda (λ) value between -5 and +5 which determines the power of the transformation applicable with the proviso that a $\lambda = 0$ implied a logarithmic transformation of the variable. EViews calculates the best λ value to apply. I did not have to transform any of my variables because my tests returned non-significant results of heteroscedasticity.

Data Analysis Plan for Research Question 1

I investigated my first research question by using the equation of Djankov et al. (2007) and Fayed (2013) as shown in Equation 21:

$$PSCREDIT_t = \alpha_0 + \alpha_1 DEBT_t + \alpha_2 FINT_{t-1} + \alpha_3 INSQUAL_t + \alpha_4 TBRATE_t + \alpha_5 GDP_t + \varepsilon_t \quad (21)$$

Research variables. The key variables were the quantity of private sector credit, PSCREDIT, and the government's domestic debt, DEBT. The key regression parameter was the regression coefficient β_1. Crowding out of the corporate sector due to DEBT implied that there should be a negative relationship between PSCREDIT and DEBT. I expected a negative coefficient of regression of DEBT.

The model included four control variables. These were the log of GDP, FINT, INSQUAL, and the TBRATE. Djankov et al. (2007) were the first to adopt these control variables in their study of private credit in 129 countries. The log of real GDP captured the idea that the cost of setting up credit market institutions required an economy to be large. I expect a positive relation between GDP and PSCREDIT because it captures business cycles (Dietrich, Wanzenried, & Cole, 2015), which in turn affect the demand for credit.

I expected FINT to be positively related to PSCREDIT because banks were expected to increase their lending activities in response to the availability of deposits. Fayed (2013) argued that increases in liquidity may result in a spurious relation between government borrowing and private credit. To overcome this situation, Fayed (2013) adopted the ratio of time deposits and savings to the monetary base as her measure of the level of financial intermediation. However, to allow for the effect of government borrowing on interest rates and thus higher saving rates, the model used a

one period lagged values of the deposits. The variable I used was, therefore expressed in the form $FINT_{t-1}$.

INSQUAL measured the quality of governance institutions in the economy. When creditors can use the institutional systems to enforce repayment of loans, they would be more willing to extend credit. Accordingly, Djankov et al. (2007) found a positive relationship between the quality of the governance institutions and private credit. I, therefore, expect a positive relationship between INSQUAL and PSCREDIT.

I expected TBRATE to have a negative relationship with PSCREDIT. Banks have the option of purchasing government debt or extending credit to borrowers. Krishnamurthy and Vissing-Jorgensen (2012) found a negative relationship between treasury demand and credit. At lower treasury rates demand falls off, and banks channel their funds as loans to borrowers.

Regression analysis. In testing the hypotheses for my first research question, I used the methods I outlined in the preceding sections. Following Fayed (2013), I performed the ADF test on my data to establish their unit root properties. My data were a mix of I(0) and I(1), and so I adopted the method of Pesaran and Shin (1999) and used the ARDL method to analyze my data and make inferences. The dependent variable was PSCREDIT. The independent variable was DEBT). The covariates were TBRATE, the log of GDP, the FINT, and INSQUAL. I lagged FINT in the regression model to account for the delayed effect of government policy on the financial market.

I used the ADF method to check the unit root properties of my data. I followed up with a bounds test to confirm their cointegration status. I then derived and tested both the long run and short run cointegration coefficients from the ADRL model. Following the ADRL analysis, I performed the Ramsey test to confirm the validity of

the analysis and the stability of the long run model. I then drew my conclusions on the effect of government borrowing on the quantity of credit available to the private sector.

Data Analysis Plan for Research Question 2

In Research Question 2, I investigated the correlation between government borrowing and the cost of credit to Ghanaian firms by using Equation 22:

$$NIM_t = \alpha_0 + \alpha_1 DEBT_{t-1} - \alpha_2 DEF_t + \alpha_3 EXCHR_t + \alpha_4 INFL_t + \alpha_5 RISK_t + \alpha_6 CONCEN_t + \alpha_7 EFF_t + \alpha_8 SIZE_t + \alpha_9 HHI + \alpha_{10} RQUAL_t + \varepsilon_t \quad (22)$$

I derived my model from that of Agca and Celasun (2012) who used a similar model for investigating the relation between corporate borrowing costs and public debts for 580 loan agreement in 15 countries. Unlike these authors, however, I used the NIM to proxy for the cost of credit instead of the loan spread, and I limited myself to corporate borrowing in the domestic market instead of in the foreign market.

Agca and Celasun (2012) used panel data for their analysis. Their use of panel data was inevitable given that their research covered individual loan applications in 15 countries and had to analyze their data by country. My study differs from theirs in that I used data from a single country. Secondly, I used national data and not data on individual loan agreements. My data was, therefore, time series instead of a panel. I used sampled data derived from the number of periods required to assure adequate power of the research's findings.

The change in research focus from external to domestic borrowing necessitated changes to the original model. Agca and Celasun (2012) focused on individual loans and firms. I investigated the cost of credit from an economy-wide perspective.

Research variables. The key variables were the cost of credit represented by NIM, and DEBT. The key regression parameter was the regression coefficient α_1. Covariates were DEF, EXCHR, RISK, CONCEN, EFF, INF, SIZE, HHI, and RQUAL. Crowding out of the corporate sector due to the domestic financing of government debt implied that there should be a positive relationship between public debt and the cost of credit. I expected a positive coefficient of regression of DEBT.

Financing the deficit would require the government to borrow from the domestic market. I expected a negative coefficient for DEF. However, DEF entered the model as a negative variable, and so the sign would remain unchanged.

EXCHR is a measure of inflation in the economy (Loloh, 2014) and its pass-through can affect profitability if the speed of adjustment were not the same (Dietrich et al., 2015). INF also measures the degree of macroeconomic instability which can lead to higher interest spreads and by extension higher NIM. Therefore, I expected a positive relationship between NIM and EXCHR and between INF and NIM.

Dietrich, Wanzenried, and Cole (2015) stated that good governance's effect on the net interest margin could be ambiguous for two reasons. Margins can narrow because of enforcement of creditor rights which may lead to the speedier recovery of overdue loans. As a consequence, banks will reduce their pricing of risk and thus decrease their margins. On the other hand, good governance may attract risky borrowers and the increase in default risk may lead to wider margins. By these arguments, I could not predict the outcome of the relationship between NIM and RQUAL.

RISK was also expected to have an ambiguous relationship with the NIM (Dietrich et al. 2015). While RISK can be low during times of economic booms,

higher volumes of lending can lead to banks suffering higher default rates. Similarly, RISK may be high during economic downturns but lower demand for credit in such periods may lead to lower default rates.

I expected EFF, a measure of the operational cost of banks to positively correlate with NIM. Dietrich et al. (2015) argued that banks need to cover their operational costs through their interest margins. Banks pass these costs on to borrowers that will lead to a positive correlation between NIM and EFF.

Bank SIZE shall have a negative correlation with NIM. Larger banks have economies of scale which they can pass on to their customers in the form of lower interest rates (Dietrich et al., 2015). I expected a negative coefficient of bank SIZE.

CONCEN and HHI measure the structure of the banking industry. CONCEN is a measure of the size of the three largest banks in the industry. According to Dietrich et al. (2015) in a highly concentrated banking structure, banks can engage in collusive activities which can drive up spreads. Therefore, I expected CONCEN and HHI to be positively correlated with NIM.

Regression analysis. Following Agca and Celasun (2012), I used regression analytical methods to document the variation of cost of credit with the government's domestic debt and to make inferences. My data analysis plan, therefore, mirrors the method I adopted to answer my first research question.

Stationarity tests yielded a mix of I(0) and I(1) variables. I, therefore, adopted the ARDL method to analyze my data and make inferences. In the model, the dependent variable was the NIM. The independent variable was DEBT. Covariates were macroeconomic variables including INF, DEF, and EXCHR. Others were SIZE, EFF, and RISK; industry variables were CONCENRQUAL). Following Agca and

Celasun (2012), I lagged DEBT to account for the delayed effect of government fiscal policy on the financial market.

Threats to Validity

External Validity

External validity is the ability to generalize the research's findings to other jurisdictions and times. An inappropriate sampling of persons, time of the study, or location of the survey can threaten the external validity of the research (Trochim, 2006). A random sampling of data, replication of the study in different jurisdictions, or selecting different time periods for analysis can eliminate these threats.

I used time series data in my research. The advantage of using time series data is that there was no sampling of the data per se thus effectively eliminating the potential for sampling bias. For a defined number of study variables, the number of periods of data required determined the sample size. I selected the time span for data collection by statistical methods to assure adequate power of the analysis. I eliminated sampling bias by this approach.

I used mathematical models in my study which made the study replicable in different jurisdictions and times. My research was an attempt to replicate studies undertaken elsewhere. For example, to answer the first research question, I adopted a mathematical model from Fayed (2013) applied to a study in Egypt. My research was an attempt to generalize the model to Ghana and to present it as appropriate for predicting FCO in developing and emerging economies.

In answering the second research question, I established the causal relationships between the cost of credit to the private sector and government borrowing from the domestic market. I adapted a mathematical model by Agca and

Celasun (2012) to test my hypothesis. The use of this mathematical model ensured replicability and generalizability of the findings, thus eliminating any threat of external validity of the research's findings.

Internal Validity

Trochim (2006) established the relevance of internal validity in cause and effect relations. Internal validity confirms that the effect measured or assessed by the research is the result of the causes attributed to it. Internal validity is, therefore, an attribute of the data used in the analysis and is not generalizable to other research even in the case of quantitative research such as mine. Quality issues such as history, maturation, mortality, testing, instrumentation, and regression threats may affect the data and create internal validity problems.

Mortality, testing, instrumentation, and regression threats are the result of primary data collection. I eliminated the potential for these threats by employing secondary data collected by the World Bank and the BoG. These institutions collect data as part of their normal reporting requirements and not for specific research purposes. Therefore, I expected that the most likely internal validity issues would be history and maturation.

History results from general changes that occur in the data over time. Unexpected changes in the economy can affect trends in the data. These unexpected effects or shocks (Sharpe, 2013) to the economy results in variations in the GDP. Therefore, to overcome the influence of history on the data, I weighted some of the variables by the GDP in the year of reporting.

Triangulation of data collection (Zohrabi, 2013) is one method of assuring data quality. My two sources of data checked each other and assured internal validity.

Additionally, I included covariates in the model which served the purpose of examining the dependent variable from other perspectives and supported the triangulation of data and results. These covariates also captured the effect of history in the data.

The BoG and the World Bank eliminated maturation effects by introducing definitions for each variable and ensuring their strict adherence. Reporting banks and countries do not have the opportunity to define or report data other than in the specified format.

Construct Validity

Construct validity, according to Trochim (2006) measures the extent to which the inferences made from a study are attributable to the theoretical constructs which underpinned the research. In my research, the validity test was to check the functional form of my models to ensure that they do not suffer from misspecification errors. I used the Ramsey's (1969) Regression Specification Error Test (RESET) method to test the functional form of my model.

The RESET detects functional form misspecification in a linear regression model. Ramsey (1969) postulated that if a linear model of the form in Equation 23:

$$y_t = \beta_0 + \beta_1 x_k + \ldots + \beta_k x_k + \mu_t \quad (23)$$

is correctly specified, then nonlinear functions of the independent variables should not be significant when added to the equation. The RESET test is to add polynomial of the OLS fitted values to linear model to detect functional form misspecification. The added polynomials are usually the squared and cubed terms (Wooldridge, 2009) to create Equation 24:

$$y_t = \beta_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \delta_1 \hat{y}^2 + \delta_2 \hat{y}^3 + \vartheta_t \quad (24)$$

where ϑ_t is an error term.

I used Equation 24 to test whether Equation 23 missed important nonlinear functions of x_i. The null hypothesis is that Equation 23 is correctly specified, that is, H_o: $\delta_1 = \delta_2 = 0$ in the equation. If the RESET test returns a significant *F* statistic, it suggests that there was a problem with the specification of the regression model and it has to be re-specified. The RESET test was available in EViews. The software reports both the *t* and *F* statistics.

Ethical Procedures

Walden University (2015) rules regarding the conduct of research are that researchers must be ethical in dealing with human subjects in the collection, storage, retrieval, and use of data. I adhered to the rules which required that researchers obtained approval from the University's IRB before proceeding with data collection. My approval number was 05-15-17-0406581.

I did not collect my data from human subjects. However, I requested for some data from the Bank of Ghana. The bank does not publish confidential data on its website. Specifically, data on individual bank performance were not available. My estimation of the HHI, for example, required data on individual bank's market share. The BoG provided anonymized data which made possible the calculation of the index without compromising on their confidentiality obligations.

I obtained some of my data by downloading from the websites of the World Bank and the BoG. These websites require no permissions. Researchers may also send comments on the data to their owners when they have any to make.

I treated the data with the utmost care. I made copies of all data I received and stored them on a backup disk. I also purchased cloud storage facilities for a 5-year

period and uploaded the data for storage. I maintained a working copy on my computer. As required by Walden, I will maintain the collected data for 5 years and destroy them afterward.

Summary

I discussed my research method in this chapter. I began with a restatement of the purpose of my research. I followed that with a discussion of my research design and the rationale for adopting a quantitative methodology. I identified my research population, discussed my sampling, and data collection method, provided operational definitions, and my expectation of the independent variable and the covariates' relationship with the dependent. I also detailed my plan for data cleaning, screening, and checking the unit root properties of my variables to determine the best estimation method. I detailed my method for performing my cointegration regression and for checking my models' residuals. I was guided by the methods Fayed (2013), Niyimbanira (2013), Pesaran et al. (2001), Pesaran and Shin (1999), and Ramsey (1969). My use of mathematical formulae and secondary data minimized any external validity threats. I stated my method for checking the stability of my models and my compliance with Walden's requirement for ethical behavior.

In next chapter, I report the results of my investigations. I start by re-stating my research the purpose, questions, and hypotheses. I follow with a discussion of my data collection efforts and conclude by reporting the findings of the statistical analysis for each research question.

Chapter 4: Results

The purpose of this quantitative research was to investigate the presence of FCO in Ghana. I posed two questions with associated hypotheses to assist with my investigations. The first research question was:

RQ_1: What was the relationship between government's domestic debt and the quantity of private sector credit?

My null hypothesis was that there was no significant relationship between government's domestic debt and the quantity of private sector credit. I tested my hypothesis by regressing the quantity of private corporate sector credit with government debt and other covariates.

The second research question was:

RQ_2: What was the relationship between government's domestic debt and the cost of credit to the private sector in Ghana?

My null hypothesis was that there was no significant relationship between government debt and the cost of credit to the Ghanaian private corporate sector. I tested the second hypothesis by regressing the cost of credit with government debt and other covariates. I operationalized cost of credit as the net interest income earned by banks in Ghana.

In the rest of this chapter, I present the of my data collection and cleaning. I follow with a detailed presentation of my data analysis and results. I end the chapter with a summary and a transition to the final chapter.

Data Collection

My data sources were the BoG and the World Bank Group databases. The World Bank data were available on their website. I downloaded data on the

governance indicator for Ghana, specifically the regulatory quality index, published by the World Bank's Governance Institute. These data are published annually and uploaded to the institute's website.

The BoG uploads banking time series data on its website aggregated at the industry level. The BoG, however, considers some data confidential, such that the BoG does not upload them to its site. I wrote to the BoG to request data from each Ghanaian bank and received financial statements on each of the banks in operation in Ghana between the years 2006 and 2016. I received anonymized data designed to prevent tracing to individual banks, an action that would have breached its confidentiality obligations. I extracted data on all my research variables from the data supplied by the BoG as shown in Table 4 and Table 5.

Data for Question 1

I summarized the variables I used to answer Question 1 in Table 4. These were one independent variable—private sector credit as a percentage of total credit; one dependent variable—government debt expressed as a percentage of total credit; and four covariables—log of GDP, level of financial intermediation, institutional quality, and the treasury bill rate. I defined each of these variables in Chapter 3. I presented data on each variable in Appendix A. In this section, I will discuss only how I obtained each variable from the data that I received.

Table 4

Source and Measurement of Variables of Research Question 1

Variable	Measurement	Source
PSCREDIT	Total loans to the private sector as a percentage of total bank credit--all loans, treasury bills, and bond purchases	Bank of Ghana
DEBT	Credit to government and its agencies--loans, treasury bills, and bond purchases as a percentage of total bank credit	Bank of Ghana
GDP	Annual nominal GDP expressed in natural logarithm	Bank of Ghana
FINT	Total deposits as a percentage of monetary base (M2)	Estimated from data available at the Bank of Ghana
INSQUAL	World Bank measure of the quality of governance ranging from -2.5 to +2.5 produced annually.	World Bank governance database
TBRATE	Average monthly 91-day treasury bill rate in percentage	Bank of Ghana

Private credit (*PSCREDIT*): I obtained the industry level data by summing all the individual private corporate credit entries for all banks in each reporting period. I divided the credit to the private sector by the total credit extended by the banks to obtain the variable.

Government domestic debt (*DEBT*): DEBT comprised treasury bill purchases, government bonds, loans, and credit advanced by commercial banks to the central government, government ministries, departments, agencies, and corporations expressed as a percentage of total credit advanced by the banks. The data used in the model were the total outstanding amount at the end of each month. I collated and summarized the data from the balance sheet of individual banks.

Gross domestic product (*GDP*): The Bank of Ghana supplied annual GDP data for the research period. The data were in annual installments only. I used the annual data to represent the GDP for each month of the applicable year in the model.

Level of financial intermediation (*FINT*): I obtained bank deposits comprising savings and time deposits from the balance sheets of individual banks. The BoG supplied the M2 data. I divided the total deposits by the M2 for each month to obtain the variable.

Institutional quality (*INSQUAL*): I downloaded the data from the website of the World Governance Institute. The data were in annual installments only. I used the annual data to represent the monthly data for each month of the applicable year in the model.

Treasury bill rate (*TBRATE*): The Bank of Ghana supplied the monthly average treasury bill rates as part of the data I requested.

Data for Question 2

I summarized the variables I used to answer Question 2 in Table 5. These were one independent variable, the net interest margin expressed as a percentage of GDP, and one dependent variable, government debt expressed as a percentage of GDP. Covariates were macroeconomic variables comprising inflation, exchange rate, and budget deficits; banking variables comprising bank size, bank efficiency, bank risks, bank concentration, and the Herfindahl-Hirschmann index; and institutional and regulatory quality index. I defined each of these variables in Chapter 3. I presented data on each variable in Appendix B. In this section, I will discuss only how I obtained the variables from the data that I received.

Table 5

Source of Variables of Research Question 2

Variable	Measurement	Source
NIM	Net interest income of banks as a percentage of nominal GDP	Estimated from data from the Bank of Ghana
INF	Percent change in headline inflation measured by the consumer price index	Bank of Ghana
DEBT	Credit to government and its agencies--loans, Treasury bills, and bond purchases by banks as a percentage of nominal GDP	Bank of Ghana
DEF	Difference between government revenue and expenditure	Bank of Ghana
EXCHR	Ghana cedis per US dollar	Bank of Ghana
SIZE	Total assets of banks	Estimated from data from the Bank of Ghana
EFF	Non-interest expenses as a percentage of total assets	Estimated from data from the Bank of Ghana
RISK	Total loans as a percentage of total assets	Estimated from data from the Bank of Ghana
HHI	Sum squared of percentage total bank assets	Estimated from data from the Bank of Ghana
CONCEN	Sum of assets of three largest banks	Estimated from data from the Bank of Ghana
RQUAL	World Bank measure ranging between -2.5 to +2.5	World Bank database

Net interest margin (*NIM*): I obtained net interest income data from the income statements of the banks. The net interest income (NII) was the interest income less the interest expense. I estimated the NIM by dividing the NII by the GDP and expressed it as a percentage. I collated the data at industry level on a monthly basis.

Inflation (*INF*): The BoG provided data on annual inflation in the country expressed in percentage. I used the annual data to represent inflation for each month of the applicable year in the model.

Government domestic debt (*DEBT*): DEBT comprised treasury bill purchases, government bonds, loans, and credit advanced by commercial banks to the central government, government ministries, departments, agencies, and corporations expressed as a percentage of total credit advanced by the banks. The data used in the model were the total outstanding amount at the end of each month. I collated and summarized the data from the balance sheet of individual banks.

Budget deficit (*DEF*): The BoG provided annual data on the budget deficit. The variable that I used in the model was the annual budget deficit divided by the GDP and expressed as a percentage. I used the annual DEF data to represent the data for each month in the applicable year.

Exchange rate (*EXCHR*): The BoG supplied monthly exchange rate data from their database.

Bank size (*SIZE*): I collated and summarized the monthly total asset values from the balance sheet of individual banks. In the model, I used total bank assets expressed as a percentage of GDP.

Bank efficiency (*EFF*): I collated the noninterest expense data from the income statement of banks, and the total asset data from their balance sheets and aggregated at the industry level. I presented the data at monthly intervals.

Bank risks (*RISK*): I extracted the total loan outstanding and total asset data from the balance sheets of the individual banks and aggregated at the industry level. I presented the data at monthly intervals.

Herfindahl-Hirschman index (*HHI*): I derived the variable by squaring the percentage of total industry assets held by each bank and aggregating at the industry level.

Bank concentration (*CONCEN*): I derived the concentration variable from the balance sheet of the banks, by dividing each bank's total assets by the total industry assets expressed as a percentage. I followed that by ranking the obtained values to arrive at the three largest which I summed and used in the model.

Regulatory quality (*RQUAL*): I obtained the variable by downloading from the website of the World Governance Institute.

Study Results for Research Question 1

I used my first research question to find out whether there was any statistically significant relationship between DEBT and PSCREDIT. On acquiring my data from the sources discussed in the preceding section, I subjected it to screening and cleaning before I entered them into the regression models for analysis.

Data Cleaning and Screening

My first action on acquiring the data was to screen and clean it. I visually inspected the data to check for duplicate data, missing data, outliers, and mistakes. Screening yielded no duplicate data. There were three missing entries and some obvious mistakes. The BoG replaced the wrong data. Data for January 2006, July 2007, and May 2015 were missing. The missingness was completely random. The BoG could not supply the missing data, so I resolved it by omitting the data for January 2006 from the database and replacing the others by interpolation between adjacent values, assuming linearity of the variable within that space. My dataset,

therefore, started from February 2006 for a total of 131 months. I reported the descriptive statistics for my first research question in Table 6.

Descriptive Statistics and Tests

I conducted descriptive statistics and tests of the data which I reported in Table 6. I reported on the range, mean, standard deviation, skewness, kurtosis, and normality for each variable. Skewness test results yielded non-significant results, ($|S| < 0.5$) for all variables. Kurtosis test also yielded non-significant results, ($|K| < 3$) for all variables.

Table 6

Descriptive Statistics of Question 1 Variables

	PSCREDIT	DEBT	FINT	GDP	INSQUAL	TBRATE
Mean	49.85484	39.94554	1.133739	24.77127	0.029801	18.22409
Median	48.81041	40.84071	1.141808	24.81454	-0.007182	20.87348
Maximum	59.49003	51.22951	1.322745	25.84315	0.132062	27.80000
Minimum	37.90047	30.93421	0.988024	23.65206	-0.071557	9.130000
Std. Dev.	5.040178	5.021522	0.064496	0.714354	0.079469	6.421331
Skewness	-0.017881	0.060913	-0.217788	-0.054931	0.114191	-0.206244
Kurtosis	2.097781	2.013978	2.771176	1.653200	1.308571	1.296771
Jarque-Bera	4.450063	5.387815	1.321391	9.966589	15.90062	16.76327
Probability	0.108064	0.067616	0.516492	0.006851	0.000353	0.000229
Sum	6530.984	5232.866	148.5198	3245.037	3.903962	2387.356
Sum Sq. Dev.	3302.441	3278.039	0.540768	66.33917	0.820990	5360.353
Observations	131	131	131	131	131	131

Check for normality of data. I checked for the normality of my research data using the Jarque-Berra (J-B) method. The test rejects a J-B statistic greater than 5.5 for normality. The results of the J-B test as presented in Table 6, indicated that PSCREDIT and FINT had normal distributions at the 5% level. DEBT was normal at the 10% level. GDP, TBRATE, and INSQUAL were not normally distributed, (i.e., their J-B values were greater than 5.5).

The solution to non-normality is data transformation. However, I adhered to Field (2013, p. 184) caution that in large samples, researchers need not worry about normality as results are likely to be significant. I chose to ignore the non-normal distribution exhibited by the affected variables.

Check for multicollinearity. I checked for collinearity among the research variables. The test is to reject a correlation coefficient of more than 0.9 between any pairs of variables that are stationary and normally distributed. However, for non-stationary data, the theoretical correlation will vary with time making it impossible to determine true correlations.

The results presented in Table 7, indicated that there were no signficant correlations between the variables except for DEBT that correlated highly with PSCREDIT (r = -.98). I ignored the relationship between DEBT and PSCREDIT in my analysis because of the potential for serial correlation within the variables. Thus, I adopted and used all the variables in the regression model.

Table 7

Pearson Correlation Test Results for Question 1 Variables

	PSCREDIT	DEBT	FINT	GDP	INSQUAL	TBRATE
PSCREDIT	1.00	-0.98	0.60	0.24	-0.21	0.68
DEBT	-0.98	1.00	-0.62	-0.31	0.19	-0.72
FINT	0.60	-0.62	1.00	0.73	0.25	0.67
GDP	0.24	-0.31	0.73	1.00	0.15	0.56
INSQUAL	-0.21	0.19	0.25	0.15	1.00	0.04
TBRATE	0.68	-0.72	0.67	0.56	0.04	1.00

Stationarity check. Based on the results of the descriptive statistics and tests, I concluded that the ordinary least square regression would yield biased and unacceptable results consistent with the literature that suggests that macroeconomic

time series data could be non-stationary (Fayed, 2013). I, therefore, proceeded to check the stationarity status of my data.

I confirmed stationarity by testing for unit roots in my data using the Augmented Dickey-Fuller (ADF) method. I used the EViews software to perform the analysis. My null hypothesis was that there were no unit roots in any of the variables. I tested each variable independently in levels[I(0)] and first differences [I(1)]. The results, summarized in Table 8, indicated that the data exhibited a mixture of I(0) and I(1). FINT was I(0). All other variables were I(1).

Table 8

Test for Unit Roots in Question 1 Variables

Variable	Levels		First Difference		Status
	Constant	Constant +trend	Constant	Constant +trend	
PSCREDIT	-2.607	-2.365	-11.222	-11.256	I(1)
	(0.094)	(0.396)	(<0.001)	(<0.001)	
DEBT	-2.581	-2.336	-9.555	-9.619	I(1)
	(0.0995)	(0.412)	(<0.001)	(<0.001)	
GDP	-0.4723	-2.857	-2.779	-2.776	I(1)
	(0.891)	(0.181)	(0.064)	(0.209)	
FINT	-2.784	-4.002	-13.027	-12.983	I(0)
	(0.063)	(0.011)	(<0.001)	(<0.001)	
INSQUAL	-1.314	-1.076	-11.274	-11.486	I(1)
	(0.622)	(0.928)	(<0.001)	(<0.001)	
TBRATE	-2.191	-1.929	-5.425	-5.486	I(1)
	(0.211)	(0.633)	(<0.001)	(<0.001)	

Note. Table reports t-statistics and *p* values in parentheses

Under these conditions of mixed levels of integration, Perasan and Shin (1999) proposed the autoregressive distributed lag (ARDL) approach to finding a cointegration relationship between the variables. I first performed the bounds test to determine the unit root properties of the variables and whether there was a long-run cointegration relationship between the variables.

Bounds test. I performed the bounds test using the EViews software. I presented the results of the bounds test in Table 9. The bounds test results returned $F = 8.515$. The F result was greater than the critical value for $I(1)$, ($F = 3.79$, $p = 0.05$), thus confirming that the model's variables were integrated of order $I(1)$. The test result also rejected the null hypothesis that no long-run relationship existed between the variables. The model, therefore, had both short- and long-run properties. I presented confirmation of these results in Table 10.

Table 9

ARDL Bounds Test Results for Question 1 Variables

Test Statistic	Value	k
F-statistic	8.515	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Note. Null Hypothesis: No long-run relationships exist

Specifying the Question 1 Regression Model

Following the results of the bounds test, I estimated the short and long-run models. I performed the ARDL analysis using the EViews software. In the ARDL model, I specified an automatic lag selection procedure with the Akaike information criterion (AIC) to select my model. The software iterated 12500 models and selected a model with parameters ARDL (1, 1, 0, 0, 3, 1) that yielded the lowest AIC result. Figure 2 presents the graph of the top twenty models showing that the selected model had lowest AIC value.

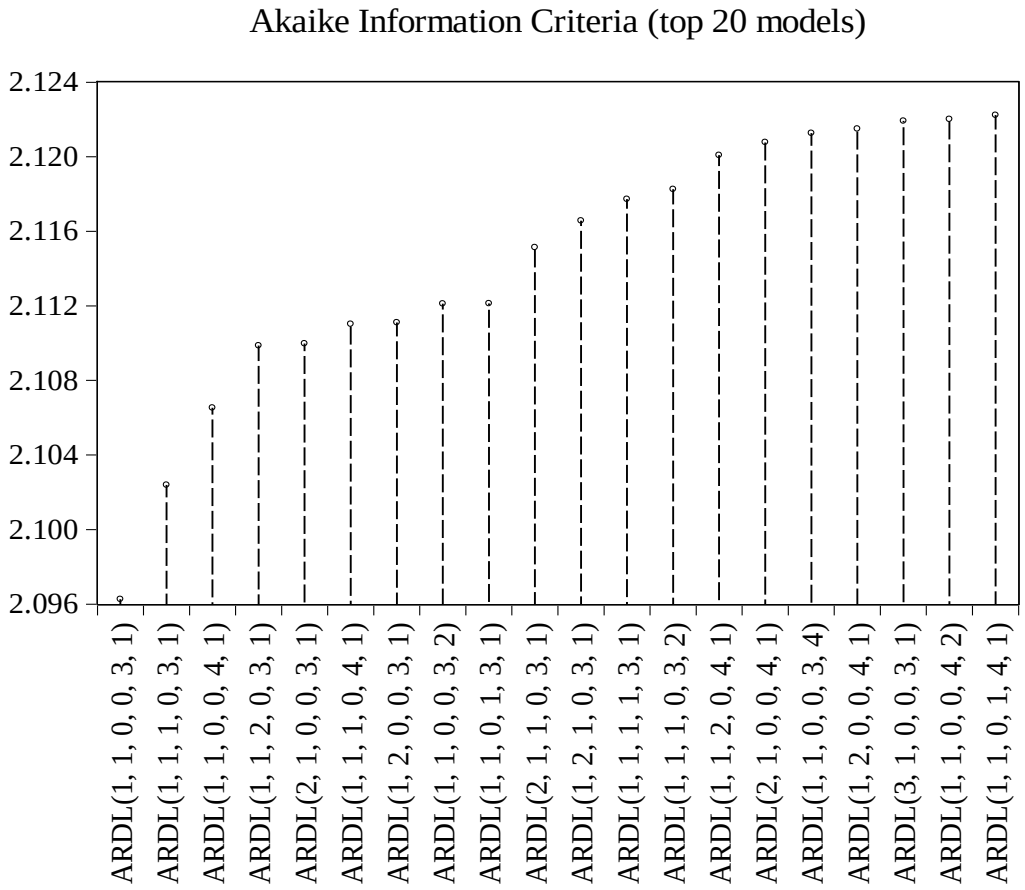

Figure 2. Akaike information criterion results for PSCREDIT.

Short-run PSCREDIT model. In Table 10, I reported the results of the cointegration test. The cointegration coefficient strongly predicted the long-run relationship, β = -.582, ρ < .001. I expected the result given that there was a long run relationship. It also indicated that the short run drift of the model returned very quickly to the long run model, that is, within two reporting periods.

DEBT significantly predicted the short-run PSCREDIT, β = -.909, ρ < .001. $FINT_{t-1}$, was a non-significant predictor of the short run PSCREDIT, β = 3.453, ρ =.112 and INQUAL was also not a significant predictor of the short-run PSCREDIT, β = -1.833, ρ =.665. However, the first lag of the institutional quality, $INSQUAL_{t-1}$,

predicted the short-run PSCREDIT, β = -13.499, ρ = .021; the second lag of institutional quality, $INSQUAL_{t-2}$ was also a significant predictor of short-run PSCREDIT, β = 12.735, ρ =.003.

Table 10

Short-Run Cointegration Coefficients for Question 1Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEBT)	-0.909530	0.049252	-18.467006	0.0000
D(FINT(-1))	3.453523	2.153556	1.603637	0.1115
D(GDP)	-0.405341	0.160574	-2.524322	0.0129
D(INSQUAL)	-1.833795	4.228972	-0.433627	0.6654
D(INSQUAL(-1))	-13.499041	5.755393	-2.345459	0.0207
D(INSQUAL(-2))	12.734713	4.203694	3.029410	0.0030
D(TBRATE)	-0.156803	0.059190	-2.649160	0.0092
CointEq(-1)	-0.581816	0.079382	-7.329334	0.0000
Cointegration equation				
Cointeq = PSCREDIT - (-0.9810*DEBT + 5.9358*FINT(-1) - 0.6967*GDP -3.1543*INSQUAL -0.0165*TBRATE + 100.0108)				

INSQUAL data was in annual installments. Thus it is not likely to affect the monthly changes in the lending regime in the industry. The growth in GDP predicted the short-run change in PSCREDIT, β = -.405, ρ = .013. TBRATE was a negative and significant predictor of the short-run PSCREDIT, β = -.157, ρ = .009.

The short run cointegration equation was given by Equation 25:

$$\Delta PSCREDIT_t = -0.909\Delta DEBT_t + 3.453\Delta FINT_{t-1} - 1.833\Delta INSQUAL_t - 13.499\Delta INSQUAL_{t-1} + 12.735\Delta INSQUAL_{t-2} - 0.157\Delta TBRATE_t - 0.405\Delta GDP_t - 0.582EC_{t-1} \quad (25)$$

where EC_{t-1} is the lagged residual from the long run relationship between the variables.

Long-run model. Table 11 is a summary of the long-run relationship between the variables as determined by the ARDL evaluation. DEBT significantly predicted

PSCREDIT, β = -.981, ρ < .001 as was expected. I found that a one-unit increase in government debt resulted in a 0.98 decrease in the volume loans extended to the private sector. In effect, government credit crowded out the private sector in the loan market.

Table 11

Long-Run Coefficients for Question 1 Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBT	-0.981039	0.047686	-20.572917	0.0000
FINT(-1)	5.935762	3.521739	1.685463	0.0946
GDP	-0.696682	0.249454	-2.792825	0.0061
INSQUAL	-3.154305	1.786238	-1.765893	0.0800
TBRATE	-0.016512	0.029306	-0.563435	0.5742
C	100.010764	5.013059	19.950048	0.0000

The result for DEBT runs contrary to the crowding in found by Fayed (2013) in Egypt and the findings of Sharpe (2013) for sovereign countries. Fayed (2013) found no significant effect of government debt on private credit in the short run. In the long-run Egyptian government debt predicted a crowd-in of private sector credit. According to Sharpe (2013), sovereign governments can print money to pay their debts and need not crowd out the private sector.

FINT was a positive and significant predictor of PSCREDIT at the 10% level, β = 5.936, ρ < .095. FINT crowded-in private sector credit as expected. FINT is a measure of bank liquidity. Thus a positive relationship was expected because higher liquidity would enable banks to make more loans after accounting for statutory reserves. The descriptive test results of Table 6 indicated a minimum, maximum, and mean FINT of 0.988, 1.322, and 1.133, an indication that the currency in circulation is nearly the same as the volume of banks deposits. I inferred from my result that

government did not resort to printing money as was suggested by Sharpe (2013), rather it borrowed from the banks to pay its debt which led to a crowding out of the private sector.

INSQUAL was also a significant predictor of PSCREDIT at the 10% level, β = -3.154, ρ = .080. The result was unexpected. INSQUAL is a measure of the quality of governance. Good governance generates confidence in the economy which will contribute towards increased investments as was reported by Djankov et al. (2007). Thus, I expected a positive relationship between INSQUAL and PSCREDIT, but the result was otherwise for Ghana. The effect of the quality of governance on the private sector credit requires further study to determine the underlying factors.

GDP growth was a significant but negative predictor of PSCREDIT at the 10% level, β = -1.191, ρ = .092. The result was consistent with the findings of Churchill et al. (2014). Increasing GDP should generate a higher demand for credit as businesses took advantage of the improved economic conditions to make investments. Dietrich et al. (2015) had found a positive relationship between GDP growth and the NIM meaning that credit became more expensive with increasing rate of GDP growth which could account for the results. The result indicated that the rate of growth of the GDP in Ghana induces a higher cost of credit probably because of increased demand that ultimately leads to lower demand as the cost becomes unaffordable for the private sector. Another reason for the negative significance could be as explained by Churchill et al. (2014) that GDP does not influence the pricing of loans in Ghana.

TBRATE was not a significant predictor of PSCREDIT, β = -.017, ρ = .574. TBRATE was expected to be negatively related to PSCREDIT. TBRATE contain information about the general level of prices in the economy and therefore should

have a negative relation with the demand for credit consistent with the findings of Fayed (2013) and Shetta and Kamaly (2014). Banks would prefer to invest in low-risk government debt than advance loans to perceived risky private sector borrowers. The negative coefficient is thus consistent with the literature, but the insignificant results could mean that the pricing of treasury bills was not a major influence on the lending capacity of banks.

The long-run relationship between PSCREDIT and the variables was:

$$PSCREDIT_t = 100.010 - 0.981DEBT_t + 5.935FINT_{t-1} - 3.154INSQUAL_t - 0.017TBRATE_t - 0.697GDP_t + \varepsilon_t \quad (26)$$

Test of Residuals

Following from the ADRL test I performed tests on the residuals. These tests were to satisfy the requirement that results were best linear unbiased estimates (BLUE) and can explain the relationship between the dependent and independent variables in the model. I checked for outliers, serial correlation, and heteroscedasticity of the residuals.

The overall ARDL model which I reported in Appendix C, returned F=561.809, $p < .001$, an adjusted R^2 of 0.98, and a Durbin-Watson (DW) statistic of 1.929. These results indicated that overall the model was robust in explaining the relationship between the variables. The DW results indicated that serial correlation was not an issue in the residuals. Figure 3 is a representation of the graphical plot of the model and the residuals.

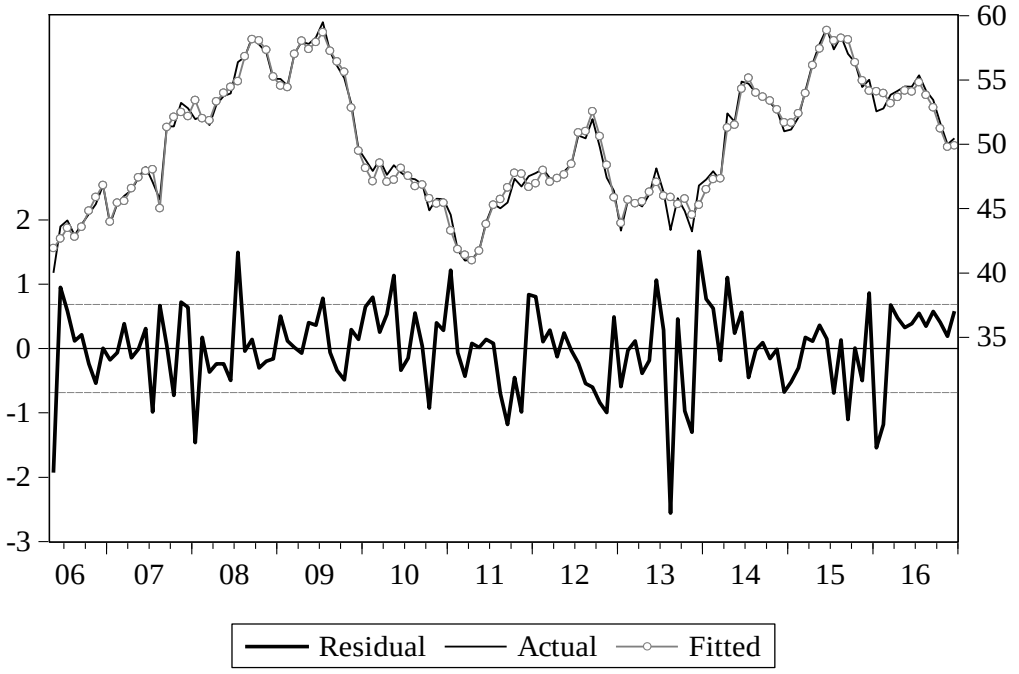

Figure 3. Private sector credit model diagnostics.

Serial correlation of residuals. I checked the residuals of the model for possible serial correlation by the Breusch-Godfrey LM test. The null hypothesis is the presence of serial correlation in the residuals. The results, Table 12, returned $F(2,114) = 0.081$, $\rho = 0.922$ rejecting the null hypothesis of serial correlation between the residuals.

Table 12

Residual Diagnostics Results for Question 1 Variables

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.081247	Prob. F(2,114)	0.9220
Obs*R-squared	0.182189	Prob. Chi-Square(2)	0.9129
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.729408	Prob. F(11,116)	0.7084
Obs*R-squared	8.280747	Prob. Chi-Square(11)	0.6880
Scaled explained SS	11.93203	Prob. Chi-Square(11)	0.3688

Heteroscedasticity test. I tested for heteroscedasticity among the residuals by the Breusch-Pagan-Godfrey method. The null hypothesis is the presence of heteroscedasticity in the residuals. The result, presented in Table 12, returned $F(11, 116) = 0.729$, $\rho = 0.708$, a non-significant output. Thus, I rejected the null hypothesis and accepted the alternative of no heteroscedasticity in the residuals.

Threats to Validity

Adequacy of the model. I checked the construct validity of my research model by confirming its adequacy using the Ramsey RESET test. I presented the results in Table 13. The test result, $F(1, 115) = 0.150$, $\rho = 0.698$, is not significant. Therefore, I rejected the null hypothesis of a non-adequately specified model.

Table 13

Ramsey RESET Test Result for Question 1 Variables

	Value	df	Probability
t-statistic	0.387926	115	0.6988
F-statistic	0.150486	(1, 115)	0.6988
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	0.071153	1	0.071153
Restricted SSR	54.44553	116	0.469358
Unrestricted SSR	54.37438	115	0.472821

Study Results for Research Question 2

In my second research question, I sought to find out whether there was any statistically significant relationship between DEBT and the NIM. I subjected the data to screening and cleaning as I described under Research Question 1 and conducted other tests described hereunder.

Descriptive Statistics and Tests

I conducted descriptive statistics and tests of the data which I reported in Table 14. I reported on the range, mean, standard deviation, skewness, kurtosis, and normality for each variable. Skewness test results yielded significant results, ($|S| < 0.5$) for NIM, DEBT, DEF, EFF, and SIZE. EXCHR ($|S| = .881$) and HHI ($|S| = .714$) exhibited slightly positive skews. The kurtosis results indicated that NIM and DEBT were significant ($|K| > 3$). The other variables returned non-significant results.

Check for normality of data. I checked for the normality of my data using the Jarque-Berra (J-B) method. The results, presented in Table 14, indicated that DEBT, RISK, and SIZE had normal distributions. All the other variables did not. Similar to Question 1, I adhered to Field (2013, p. 184) caution and ignored the non-normal distribution exhibited by the other variables.

Table 14

Descriptive Statistics of Research Question 2 Variables

	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
Mean	0.253	9.613	-7.284	1.970	13.434	33.026	3.865	673.875	48.880	31.842	0.030
Median	0.249	9.618	-6.813	1.517	12.810	31.465	3.875	626.038	48.532	31.804	-0.007
Maximum	0.529	13.432	-4.005	4.187	20.740	43.925	7.818	982.347	58.797	42.278	0.132
Minimum	-0.055	6.653	-11.483	0.909	8.390	23.808	0.537	497.213	38.000	19.335	-0.072
Std. Dev.	0.080	1.420	2.294	1.036	3.837	5.680	2.090	124.522	4.180	5.339	0.079
Skewness	-0.017	0.325	-0.407	0.881	0.276	0.304	0.037	0.714	0.223	-0.351	0.114
Kurtosis	4.473	3.055	2.065	2.351	1.625	1.948	1.829	2.436	3.369	2.457	1.309
Jarque-Bera	11.846	2.320	8.394	19.237	11.993	8.057	7.519	12.873	1.829	4.299	15.901
Probability	0.003	0.314	0.015	0.0001	0.002	0.018	0.023	0.002	0.401	0.117	0.0004
Sum	33.189	1259.325	-954.142	258.094	1759.832	4326.350	506.349	88277.670	6403.219	4171.334	3.904
Sum Sq. Dev.	0.826	262.256	684.390	139.474	1913.573	4194.083	567.763	2015747.000	2271.113	3705.616	0.821
Observations	131	131	131	131	131	131	131	131	131	131	131

Table 15

Pearson Correlation Test Results for Question 2 Variables

	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
NIM	1.00	0.57	-0.36	0.73	0.42	-0.69	0.29	-0.67	-0.02	0.77	0.02
DEBT	0.57	1.00	-0.33	0.42	-0.08	-0.64	0.32	-0.64	-0.48	0.60	0.42
DEF	-0.36	-0.33	1.00	-0.40	-0.10	0.44	0.08	0.47	-0.03	-0.37	-0.27
EXCHR	0.73	0.42	-0.40	1.00	0.47	-0.87	0.001	-0.80	-0.18	0.75	-0.16
INF	0.42	-0.08	-0.10	0.47	1.00	-0.21	0.005	-0.19	0.65	0.57	-0.33
CONCEN	-0.69	-0.64	0.44	-0.87	-0.21	1.00	-0.001	0.99	0.44	-0.81	-0.29
EFF	0.29	0.32	0.08	0.001	0.005	0.00	1.00	0.00	0.06	0.21	-0.05
HHI	-0.67	-0.64	0.47	-0.80	-0.19	0.99	-0.0002	1.00	0.41	-0.81	-0.39
RISK	-0.02	-0.48	-0.03	-0.18	0.65	0.44	0.06	0.41	1.00	0.02	-0.32
SIZE	0.77	0.60	-0.37	0.75	0.57	-0.81	0.21	-0.81	0.02	1.00	0.24
RQUAL	0.02	0.42	-0.27	-0.16	-0.33	-0.29	-0.05	-0.39	-0.32	0.24	1.00

Check for multicollinearity. I checked for collinearity among the research variables. The results presented in Table 15, indicated that CONCEN and HHI were highly correlated. Both variables were measures of the level of competition in the banking industry, therefore, and following Dietrich et al. (2015), I retained CONCEN and omitted HHI from the regression analysis. No other pairs of variables exhibited any significant level of correlation to be of concern.

Stationarity check. Based on the results of the descriptive statistics and tests, I concluded that the ordinary least square regression would yield biased and unacceptable results consistent with the literature which suggest that macroeconomic time series data could be non-stationary (Fayed, 2013). I, therefore, proceeded to check the stationarity status of my data. I tested for unit roots in my data using the ADF method. My null hypothesis was that there were no unit roots in any of the variables. I tested each variable independently in levels and first differences. The summarized results in Table 16 indicated that the data exhibited a mixture of I(0) and I(1). NIM and DEBT were I(0) whereas the rest of the variables were I(1).

Table 16

Test for Unit Roots in the Question 2 Variables

Variable	Levels		First Difference		Status
	Constant	Constant +trend	Constant	Constant +trend	
NIM	-1.671116 (0.4434)	-5.361236 (<0.001)	-11.02985 (<0.001)	-10.97943 (<0.001)	I(0)
DEBT	-3.311802 (0.0164)	-3.978110 (0.0117)	-12.69320 (<0.001)	-12.64181 (<0.001)	I(0)
INF	-1.454263 (0.5535)	-1.454411 (0.8399)	-7.680668 (<0.001)	-7.632020 (<0.001)	I(1)
DEF	-2.081022 (0.2527)	-2.284055 (0.4392)	-11.14596 (<0.001)	-11.11351 (<0.001)	I(1)
EXCHRATE	1.068173 (0.9971)	-1.374955 (0.8637)	-6.540873 (<0.001)	-6.832527 (<0.001)	I(1)
SIZE	-1.871504 (0.3447)	-2.717032 (0.2319)	-15.92579 (0.001)	-15.86325 (<0.001)	I(1)
EFF	-1.907101 (0.3281)	-2.023612 (0.5820)	-3.730993 (0.0048)	-3.748001 (0.0231)	I(1)
HHI	-2.637885 (0.0881)	-2.034390 (0.5766)	-14.25960 (<0.001)	-14.57480 (<0.001)	I(1)
CONCEN	-1.116518 (0.7079)	-1.819383 (0.6896)	-15.41393 (<0.001)	-15.38694 (<0.001)	I(1)
RISK	-1.540241 (0.5101)	-1.679339 (0.7549)	-11.08353 (<0.001)	-11.05070 (<0.001)	I(1)
RQUAL	-1.31374 (0.6219)	-1.07648 (0.9282)	-11.2745 (<0.001)	-11.4862 (<0.001)	I(1)

Note. Table reports t-statistics; *p* values in parentheses

Under these conditions of mixed levels of integration, I adopted the ARDL approach to finding a cointegration relationship between the variables. I first performed the bounds test to determine the unit root properties of the variables and whether there was a long-run cointegration relationship between the variables.

Bounds test. Following from the ARDL analysis, I performed the bounds test to determine the stationarity of the variables. I presented the results of the bounds test in Table 17. The bounds test results returned $F = 11.1586$. The result is greater than

the critical value for I(1) (F = 3.30, ρ = 0.05). Thus, the model's variables are all I(1). By the test results, I also rejected the null hypothesis that no long-run relationship existed between the variables. The model, therefore, had both short- and long-run properties. I confirmed these by the results presented in Table 18.

Table 17

Bounds Test Results for Question 2 Model

Test Statistic	Value	k
F-statistic	22.84775	9
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	1.88	2.99
5%	2.14	3.30
2.50%	2.37	3.60
1%	2.65	3.97

Note. Null Hypothesis: No long-run relationships exist

Specifying the Question 2 Regression Model

Following the results of the bounds test, I used the ARDL method to estimate the short- and long-run models. In the ARDL estimation, I specified an automatic lag selection procedure with the AIC as my model selection criteria. The software iterated 7812500 models and selected a model with the parameters ARDL (1, 3, 0, 0, 0, 4, 3, 0, 4, 0). I presented the results of the ARDL results in Appendix 4. In Figure 4 I presented the graph of the top twenty models showing that the selected model had lowest AIC value.

In the ARDL results, the first lag of NIM, NIM_{t-1} was significant (β = -.337, ρ < .001). The other variables returned varying levels of significance in their different lags. Overall, the model returned an F = 18.250, ρ < .001, a DW statistic of 2.064, and an adjusted R^2 = 0.811. These results confirmed the presence of unit roots in the NIM

data, a necessary condition for the application of the ARDL methodology. The results also confirmed the model as adequate for explaining the relationship between NIM, the independent variable, and the covariates.

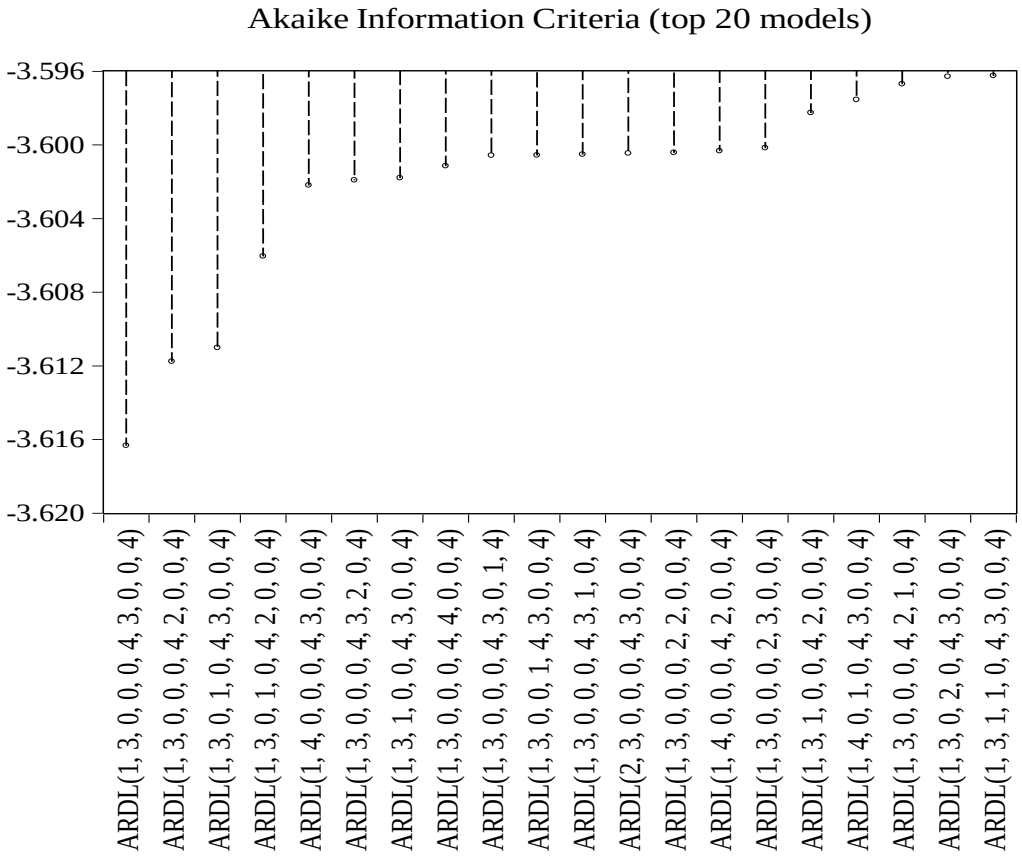

Figure 4. Akaike information criterion results for NIM.

Short-run NIM model. In Table 18, I reported the results of the cointegration test. The error correction coefficient was -1.337 and strongly significant ($\rho < .001$). The result was much lower than expected. However, Narayan and Smyth (2006) intimated that a coefficient between -1.0 and -2.0 is acceptable because it indicates a diminishing and fluctuating form of convergence of the short-run drift of the model to the long-run equilibrium.

Table 18

Short-run Coefficients for Question 2 Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEBT(-1))	0.014292	0.008265	1.729239	0.0868
D(DEBT(-2))	-0.003498	0.009739	-0.359224	0.7202
D(DEBT(-3))	0.016166	0.007326	2.206669	0.0296
D(DEF)	0.000726	0.002144	0.338674	0.7356
D(EXCHR)	0.089497	0.01961	4.563841	0.0000
D(INF)	-0.004903	0.002589	-1.894182	0.061
D(CONCEN)	-0.016704	0.005306	-3.148249	0.0022
D(CONCEN(-1))	-0.007213	0.00643	-1.121779	0.2646
D(CONCEN(-2))	0.000807	0.006067	0.13295	0.8945
D(CONCEN(-3))	-0.01034	0.005351	-1.932344	0.0561
D(EFF)	0.004991	0.002515	1.984751	0.0499
D(EFF(-1))	0.004221	0.003379	1.248978	0.2145
D(EFF(-2))	0.003881	0.00272	1.426595	0.1568
D(RISK)	0.005074	0.002384	2.127853	0.0358
D(SIZE)	0.008604	0.002379	3.616583	0.0005
D(SIZE(-1))	0.006751	0.003082	2.19031	0.0308
D(SIZE(-2))	0.003446	0.003025	1.139269	0.2573
D(SIZE(-3))	-0.008673	0.002438	-3.557524	0.0006
D(RQUAL)	0.090602	0.124142	0.729832	0.4672
CointEq(-1)	-1.336792	0.087791	-15.226907	0.00000
Cointeq = NIM - (0.0184*DEBT(-1) + 0.0005*DEF + 0.0669*EXCHR - 0.0037*INF + 0.0065*CONCEN + 0.0023*EFF + 0.0038*RISK + 0.0047*SIZE + 0.0678*RQUAL -0.5665)				

All the model's variables were also significant predictors of the change in the dependent variable as shown in Table 18. The short-run model's equation is therefore given by Equation 27:

$$\Delta NIM_t = 0.014\Delta DEBT_{t-1} - 0.003\Delta DEBT_{t-2} + 0.016\Delta DEBT_{t-3} + 0.001\Delta DEF_t + 0.089\Delta EXCHR_t - 0.005\Delta INF_t + 0.005\Delta RISK_t + 0.007\Delta SIZE_t + 0.003\Delta SIZE_{t-1} - 0.009\Delta SIZE_{t-3} - 0.017\Delta CONCEN_t - 0.007\Delta CONCEN_{t-1} + 0.001\Delta CONCEN_{t-2} -$$

$$0.010\Delta CONCEN_{t\text{-}3} + 0.005\Delta EFF_t + 0.004\Delta EFF_{t-1} + 0.004\Delta EFF_{t-2} + 0.091\Delta RQUAL_t - 1.34EC_{t\text{-}1} \quad (27)$$

where $EC_{t\text{-}1}$ is the lagged residual from the long run relationship between the variables.

Long-run NIM model. In Table 19 I presented a summary of the long-run relationship between the variables as determined from the ARDL evaluation. DEBT had a positive and significant relationship with NIM, $\beta = .0184$, $\rho < .001$. The result was as expected. Significantly, the coefficient of DEBT implied that government debt in the preceding period accounted for nearly 2% increase in NIM in the current period.

Table 19

Long-run Model Coefficients for Question 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBT(-1)	0.018447	0.003796	4.858948	0.0000
DEF	0.000543	0.001604	0.338644	0.7356
EXCHR	0.066949	0.014355	4.663698	0.00000
INF	-0.003668	0.001933	-1.8973	0.0606
CONCEN	0.006489	0.003032	2.1399	0.0347
EFF	0.002338	0.002395	0.976001	0.3314
RISK	0.003795	0.001783	2.128581	0.0357
SIZE	0.004666	0.002238	2.084892	0.0396
RQUAL	0.067776	0.093089	0.728077	0.4682
C	-0.566548	0.128224	-4.418431	0.00000

Similarly, EXCHR, INF, and RISK were all significant predictors of the NIM, thus confirming the findings of Churchill et al. (2014), Dietrich et al. (2015), and Mensah and Abor (2014). EXCHR and INF are macroeconomic variables with major influence on the economy.

DEF did not exhibit a significant relationship with NIM, β = -.007, ρ = .749. The findings could be because of the partial reliance on foreign sources of funds to finance the budget deficits consistent with the findings of Hubbard (2012) that foreign savings could reduce the effect of the deficit on interest rates. Data from the Ministry of Finance (2015) of Ghana indicated that foreign source financing of the deficit had been up to 50% of the total for the period 2008 and 2014. The second reason that I can assign to the non-significant results is the fact that the domestic debt accounts for part of the deficit, thus rendering the variable was redundant in the model. Therefore, the non-significant result of the DEF was not unexpected.

EXCHR significantly predicted NIM, β = .067, ρ < .001. Significantly EXCHR explained nearly 7% of the variation in the NIM of banks. The positive impact on NIM and, by extension, the cost of capital, was expected because increases in the rate signaled depreciation of the Ghanaian currency, and banks were expected to adjust their lending rates to maintain their level of profitability. The significant coefficient indicated a strong pass-through effect of exchange rate shocks on interest rates contrary to Loloh (2014) who reported an incomplete effect.

INF significantly predicted NIM at the 10% level, β = -0.004, ρ = 0.061. I expected INF to correlate positively with NIM. Mensah and Abor (2014) had reported a positive relationship between inflation and interest rates because banks were supposed to account for inflation in pricing the loans. My result contradicted their findings. Loloh (2014) reported that Ghanaian producers endure a reduction in their profit margins because of an inability to pass-through exchange rate shocks to their consumers. My result seems to show that a similar situation exists in the case of

inflation and NIM—Ghanaian banks endure a reduction in their margins due to inflation.

RISK significantly predicted NIM, $\beta = .004$, $\rho = .036$. The role of RISK in NIM is ambiguous (Dietrich et al., 2015). I measured RISK as the ratio of total loans to bank assets. I expected therefore that the greater the volume of loans granted, the higher the interest margins to be earned but also the higher the risk of default. Thus, the positive relationship was appropriate. The positive and significant relations between RISK and NIM were as expected and confirm Were and Wambua (2014) who found a positive correlation between bank-specific factors and interest rate spreads.

CONCEN was a significant predictor of NIM $\beta = .006$, $\rho = .035$. The results confirm my expectations and the findings of Dietrich et al. (2015) for developing countries. My results also confirm the findings of Mensah and Abor (2014) that concentration in the banking industry in Ghana leads to higher interest margins. The basic assumptions of the findings of these authors were that in highly concentrated markets, banks have enough market power to pass their costs to customers. It appears that competition among Ghana's banks is not strong enough to affect their earnings.

EFF did not significantly predict NIM, $\beta = .002$, $\rho = .331$. The finding run counter to my expectations. Bank interest rates contain information about their overhead expenses as well as the cost of the risk of the loans they advance to customers. I expected that increases in the variable would be passed on to customers in the form of higher borrowing and lower saving rates (Dietrich et al., 2015). The

non-significant nature of the results indicated that Ghanaian banks do not accommodate all their costs in their interest rates.

SIZE significantly predicted NIM, β = .005, ρ = .0396. Obviously, the growth of bank assets, my measure of SIZE, had a bearing on NIM thus confirming Mensah and Abor (2014). It is an indication that Ghanaian banks took advantage of the growth in their asset base in the market.

Overall, the relations between bank-specific factors and NIM confirm some of Were and Wambua (2014). The authors found that bank size, credit risk, return on average assets, and operating costs had a positive effect on interest rate spreads whereas higher bank liquidity ratio has a negative effect. My findings are that bank size is significant but not operating costs probably because Ghanaian banks do not accommodate all their costs in their interest rates.

RQUAL did not significantly predict NIM, β = .068, ρ = .468. The result run counter to expectations. The quality of regulations, especially, regulations that protect lenders should to boost confidence in the sector and lead to a high lending regime that will contribute to higher interest margins. Obviously, the situation in Ghana is different.

The long-run relationship between NIM and the variables was, Equation 28:

$$NIM_t = -0.567 + 0.0184DEBT_{t-1} - 0.0005DEF_t + 0.0669EXCHR_t - 0.0037INFL_t + 0.0038RISK_t - 0.0065CONCEN_t + 0.0023EFF_t - 0.047SIZE_t + 0.0678RQUAL_t + \varepsilon_t \quad (28)$$

Test of Residuals

Following from the ADRL test I performed tests on the residuals. These tests were to satisfy the requirement that results were BLUE and can explain the relationship between the dependent and independent variables in the model. I checked for outliers, serial correlation, and heteroscedasticity of the residuals.

The overall ARDL analysis, presented in Appendix D, returned an $F(18.250, \rho < 0.001)$ and a DW statistic of 2.065. These results indicated that overall, the model was robust in explaining the relationship between the variables. The DW results indicated that serial correlation was not an issue in the residuals. Figure 5 is a representation of the graphical plot of the model and the residuals.

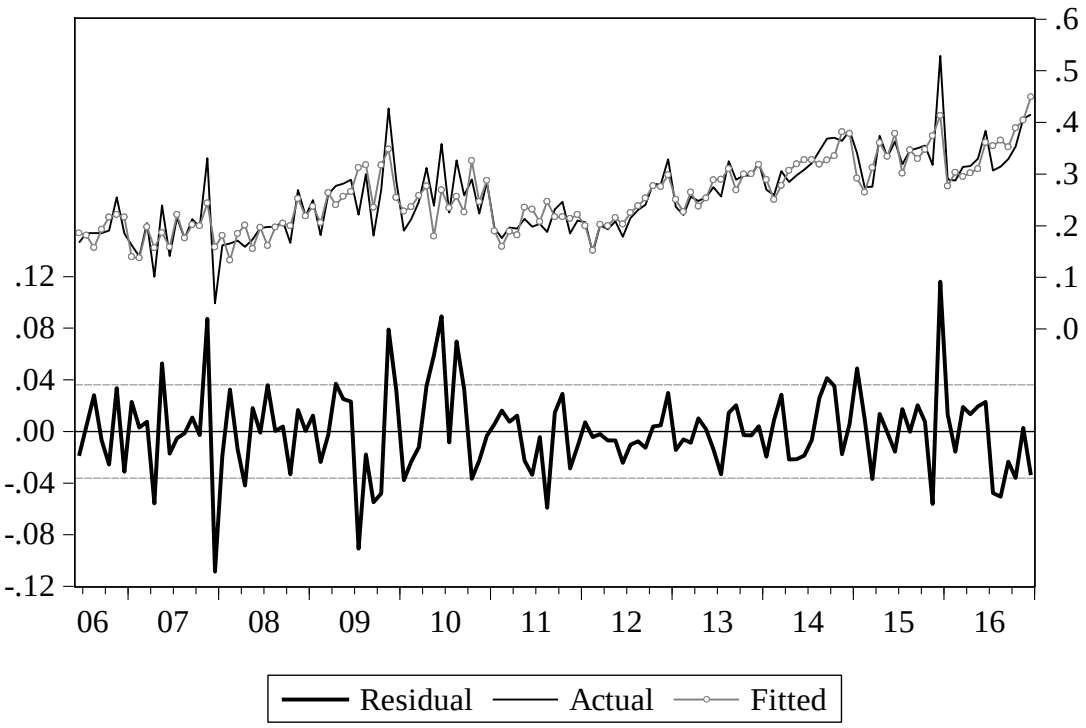

Figure 5. NIM model residual diagnostics.

Serial Correlation of Residuals. I checked the residuals of the model for possible serial correlation by the Breuch-Godfrey LM test. The results, Table 20, returned $F(2, 100) = 0.529$, $\rho = 0.591$ rejecting the null hypothesis of serial correlation between the residuals.

Table 20

Residual Diagnostics Results for Question 2 Variables

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.528756	Prob. F(2,100)	0.591
Obs*R-squared	1.328985	Prob. Chi-Square(2)	0.5145
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.240585	Prob. F(24,102)	0.2267
Obs*R-squared	28.69536	Prob. Chi-Square(24)	0.2318
Scaled explained SS	36.50878	Prob. Chi-Square(24)	0.049

Heteroscedasticity test. I tested for heteroscedasticity among the residuals by the Breusch-Pagan-Godfrey method. The null hypothesis is the presence of heteroscedasticity in the residuals. The results $F(24, 102) = 41.241$, $\rho = 0.227$, is not significant. Thus, I rejected the null hypothesis and accepted the alternative of no heteroscedasticity in the residuals.

Threats to Validity

Adequacy of the model. I checked the construct validity of my model by confirming its adequacy using the Ramsey RESET test. I presented the results in Table 21. The test result was not significant $F(1, 101) = 0.117$, $\rho = 0.733$. Therefore, I rejected the null hypothesis of a non-adequately specified model.

Table 21

Ramsey RESET Test Result for Research Question 2 Residuals

	Value	df	Probability
t-statistic	0.342207	101	0.7329
F-statistic	0.117106	(1, 101)	0.7329
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	0.000155	1	0.000155
Restricted SSR	0.133779	102	0.001312
Unrestricted SSR	0.133624	101	0.001323

Summary

In this chapter, I presented the results of my data analysis. In my research, I investigated the incidence of FCO in Ghana along the quantity and cost channels. I obtained data from the BoG and the World Bank for the period February 2006 to December 2016, a total of 131 data entries. I subjected my data to initial checks for multicollinearity, normality, and unit root properties. The variables were a mix of I(0) and I(1), and some violated the normality assumptions. I, therefore, used the ARDL method to analyze the data.

The results for PSCREDIT indicated that there was both a short-run and long-run cointegration relationship between the variables. I also found a negative and significant relationship between my dependent and independent variables an indication of the presence of FCO in Ghana along the quantity channel. The results for NIM exhibited similar long- and short-term cointegration relationships between the dependent, independent, and covariables. The results indicated a significant and positive relationship between the dependent and independent variable, thus showing the presence of FCO along the cost channel.

The next chapter is my final for the dissertation. In that chapter, I discussed my findings, drew conclusions, made recommendations for further research, and discussed the positive social impact aspect of my research.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this quantitative research was to investigate the presence of FCO in Ghana. I did this by examining the relationship between the government's domestic debt and the credit advanced to the private corporate sector by Ghanaian banks. My objective was to use the results to determine whether the government crowded out the private sector regarding the quantity of credit and the cost of credit to show that FCO exists in the Ghanaian economy.

FCO is one of the several theories that explain the lack of access to finance for the private sector. FCO theory is, however, still evolving (Aisen & Hauner, 2013) with diverging opinions. In Ghana, Sheriff and Amoako (2014) found evidence of a short-term relationship between macroeconomic variables and the IRS, pointing to a potential presence of FCO. My research extended their work by incorporating bank-specific variables and investigating FCO along both the quantity and cost channels following the steps of Fayed (2013) and Sharpe (2013).

My results indicated that there is a long-term negative relationship between PSCREDIT and DEBT, and a long-term positive relationship between NIM and DEBT. These results provide evidence that government borrowing affects the supply of credit to the private corporate sector. In effect, based on the data available at this time, the GoG's policy of borrowing from the domestic market to offset some of the budget deficit crowded out the private sector from the loan market.

Interpretation of Findings

Several factors determine how firms gain access to credit for their operations in a country. Researchers including Dietrich et al. (2015), Gimet and Lagoarde-Segot,

(2012), Joeveer (2013), and Love and Peria (2015) identified these factors and noted that they operated at the levels of the economy, firm, household, and lending institutions or banks. Using the method of Deltuvaite and Sineviciene (2014), I concluded that Ghana's credit market is bank driven. At this level of operations, neoclassical theory indicates that there will be competition for funds, that can drive up the cost of credit. In this research, I hypothesized that government's domestic borrowing accounted for the high cost and low quantities of credit available to the private sector in Ghana under the phenomenon described as FCO. I posed two questions along the quantity and cost channels to investigate whether there was FCO in Ghana; that is, whether the government's domestic debt competed with credit to the private corporate sector.

Research Questions

My first question asked about the relationship between the government's domestic debt and the quantity of private sector credit. I tested the null hypothesis that there was no significant relationship between the government's domestic debt and the volume of private sector credit. My second research question asked about the relationship between government's domestic borrowing and the cost of credit to the private sector. I tested the null hypothesis that there was no significant relationship between the cost of credit, which I operationalized as the NIM and government debt.

Findings of the Research

I used a regression model of the form $Y_t = \beta_0 + \beta_1 X + \varepsilon_t$, where Y_t is the dependent variable, β_0 and β_1 are regression constants, X_t is the independent variable, and ε_t is the error term. My key independent variable was the government's domestic

debt represented by X_t in the model. In the presence of crowding out, the constant $\beta_1 < 0$, and if the error term, ε_t, is random, the constant β_1 will be an unbiased, consistent, and efficient estimator of FCO in both the short and long term. Where the dependent variable correlated with both the current and lagged values of X_t, it creates a distributed-lag model, and the relationship between the dependent variable and the independent will be of the form: $Y_t = \beta_0 + \beta_1 X_t + \beta_2 X_{t-1} + \beta_2 X_{t-2} + \ldots + \beta_n X_{t-n} + \varepsilon_t$. Under these circumstances, there is both a short-run and long-run relationship between the variables. The short-run relation shall be β_1 whereas the long-term relationship will be of the form $\Sigma^{n}_{t=1}\beta_t = \beta_1 + \beta_2 + \beta_3 + \ldots + \beta_n$. The two estimators were the key results that I relied on to answer the research questions to determine whether credit to the Ghanaian private sector was the product of the government's domestic debt.

Findings of Research Question 1. The findings of the investigation of FCO along the quantity channel yielded a β_1 and β_t of -0.909 and -0.981, respectively. These results indicated that by the available data, the government's borrowing activities crowded out the private sector in both the long and short runs. In the long term, a one-unit increase in DEBT reduced PSCREDIT by 0.98 units.

Findings of Research Question 2. The findings of the investigation of FCO along the quantity channel yielded a β_1 and a β_t of 0.0143 and 0.0184, respectively. The findings indicated by available data, DEBT was responsible for the net income margins earned by the banking industry. A one-unit increase in DEBT resulted in a 0.0184-unit increase in the NIM in the long term.

Importance of the Findings

My study contributed to the rhetoric on FCO by establishing that there was FCO in the Ghanaian economy. Aisen and Hauner (2013) reported the inconclusive nature of research findings on FCOs. My results, based on the available data, make a categorical statement on the phenomenon in the Ghanaian economy. My results contradict Fayed (2013), who did not find any long- or short-term FCO in Egypt, but rather a crowding in of credit. My results also contradict Sharpe (2013), who argued that sovereign states need not suffer FCO because the government can resort to the printing of money to settle its debts.

The results provide a window into the effect of macroeconomic policies as well as banking operations in the country. The government, acting through its ministry of finance, is responsible for the macroeconomic policies and management of the country. These policymakers can use my results to quantify the extent and effect of government fiscal policies on the private corporate sector and to support policy revision.

Ghana is a lower-middle-income country and had benefited from substantial International Development Association (IDA) and IMF loans, and bilateral assistance from several countries. In addition to the external loans, the GoG borrows extensively from the domestic market to supplement its revenue shortfalls. In 2011, the government adopted a public-private partnership (PPP) policy (Ministry of Finance, 2011) for infrastructure development in the country. The objective was for the private corporate sector to partner government to deliver needed key public infrastructure and services to the people of Ghana. PPPs are project financed and, therefore, highly

levered with debt-to-total capital levels in the range of 74% to 75% (Esty, Chavich, & Sesia, 2014). Competing with the private sector for bank credit can be detrimental to the implementation of the PPP policy.

Limitations of the Study

In this research, I sought to correlate the quantity and the cost of credit to the private corporate sector with government debt. The sector comprises industries of various types and sizes, and with different credit ratings. I did not attempt to differentiate between the institutions. It was possible that some sectors received better services than others. However, I overcame this limitation by aggregation (i.e., the estimates were at country and not at the level of the firm). The implication was that the results I obtained addressed the issues of cost and quantity of private sector credit at the aggregate level without distinguishing between sectors of the economy.

I used data from the BoG and World Bank. The reliability and accuracy of the data were beyond my control as a researcher. However, these are credible institutions with several years' experience in data collection, cleaning, analysis, and dissemination. The reliability of the data from these sources was a reasonable expectation.

The frequency of my data was a mixture of annual and monthly intervals. The BoG reported macroeconomic variables in annual intervals whereas banking data was monthly. To assure adequate power for the research's findings, I adopted the monthly intervals as my period that resulted in 131 data points. To overcome the lack of monthly macroeconomic data I adopted the annual data for each month for the reporting year. The resulting dataset violated the normality assumptions. It is possible

that the distribution led a less than robust statistical estimates. However, these macroeconomic variables were covariables only, so I expected their effect on the models to be minimal.

Recommendations

My research has brought to the fore the fact that government debt crowded out the private sector. If the private sector is to be the engine of growth, then every effort must be made to support their operations. Government has to review its fiscal policies. The policy on deficit financing requires revision and reassessment because the net effect on the economy could be negative.

NIM, the dependent variable for the second research question, had information on interest rates. Ghanaian businesses report high interest rates. I will recommend studies that will review interest rate cost build up with the aim of determining the contribution of government debt to the overall interest charged borrowers. I will encourage further research to determine other factors that may be driving up interest rates and by extension the NIM, which does not include increases in the demand for loans.

Carpenter and Demiralp (2006) stated that open market operations by a central bank affect nominal interest rates, the so-called liquidity effect. A central bank can, therefore, stabilize interest rates as well as the quantities of funds available to the banking system by engaging in open market operations. I would recommend that the BoG use their open market operations as a strategy to stabilize both liquidity and interest rates to reduce the incidence of crowding out of Ghanaian businesses.

The research period was from 2006 to 2016. The period included the credit crunch period when the world's economy suffered a major setback. I did not account for this period in my analysis. I recommend further research to study the effect of the credit crunch on the quantity and cost of credit in Ghana during the period.

Implications

I investigated FCO as a possible problem confronting the Ghanaian corporate sector's quest for credit. The underlying principle of the research was that access to credit is essential for businesses to survive and thrive in an economy. FCO, according to Gaye (2013), results in a slowdown or stagnation in economic activities, growth, and welfare. Broner et al. (2014) stated that it could induce financial crisis, whereas Asogwa and Okeke (2013) listed low industrial growth and job losses among its many effects. Another effect would be a lower investment in research and development in the economy (Cecchetti & Kharroubi, 2015). These identified negative effects of a credit squeeze would be minimized or avoided in the presence of adequate and affordable credit. Therefore, the positive social change implications of the study are obvious: the revision of fiscal policies which can contribute to a better quality of life for all Ghanaians when the private sector can invest and grow the economy.

Conclusions

The purpose of my study was to investigate the presence of FCO in Ghana. I did this by correlating government debt with the quantity of credit to the private sector, and government debt with the NIM of Ghanaian banks. I used data from the BoG and the World Bank databases for my research. My data spanned the years 2006 to 2016. The findings of the research, based on the available data and my research

models, indicated the presence of FCO in Ghana along both the quantity and cost channels. The result contributes to the rhetoric on FCO, which remains inconclusive among researchers. My results contradict the findings of Fayed (2013), who found long-term crowding in in Egypt, and Sharpe (2013), who argued that based on the modern money theory, FCO cannot occur in sovereign states like Ghana. I hope that policymakers in Ghana will take notice of my findings and revise their fiscal policies. At the current level of economic development with high interest rates compared with those in similar countries, unbridled borrowing by the government from the domestic market will stifle local investment initiatives and stunt economic development.

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Appendix A: Dataset for PSCREDIT Analysis

MONTH	PSCREDIT	DEBT	FINT	GDP	INSQUAL	TBRATE
2006M02	37.900	51.230	1.011	23.652	-0.072	10.290
2006M03	39.729	50.669	1.018	23.652	-0.072	9.800
2006M04	40.155	50.215	1.029	23.652	-0.072	9.630
2006M05	40.005	48.436	1.010	23.652	-0.072	9.680
2006M06	43.628	46.732	1.015	23.652	-0.072	10.200
2006M07	44.087	47.049	0.993	23.652	-0.072	9.680
2006M08	42.935	47.861	1.015	23.652	-0.072	10.280
2006M09	43.786	46.972	1.033	23.652	-0.072	10.350
2006M10	44.585	45.713	1.040	23.652	-0.072	10.500
2006M11	45.354	44.501	1.025	23.652	-0.072	10.400
2006M12	46.822	43.454	0.988	23.652	-0.072	9.600
2007M01	43.799	46.443	1.015	23.865	-0.072	9.900
2007M02	45.388	44.730	1.029	23.865	-0.072	9.700
2007M03	45.988	44.698	1.035	23.865	-0.072	9.600
2007M04	46.431	43.897	1.055	23.865	-0.072	9.600
2007M05	47.414	42.949	1.033	23.865	-0.072	9.600
2007M06	48.248	42.396	1.040	23.865	-0.072	9.600
2007M07	47.060	42.459	1.053	23.865	-0.072	9.700
2007M08	45.708	45.298	1.082	23.865	-0.072	9.800
2007M09	51.388	38.926	1.115	23.865	-0.072	9.800
2007M10	51.398	38.350	1.054	23.865	-0.072	10.250
2007M11	53.221	37.511	1.058	23.865	-0.072	10.600
2007M12	52.813	38.472	1.012	23.865	-0.072	10.600
2008M01	51.966	36.851	1.058	24.130	-0.031	10.800
2008M02	52.185	37.586	1.082	24.130	-0.031	10.800
2008M03	51.485	38.779	1.086	24.130	-0.031	11.100
2008M04	53.088	36.653	1.107	24.130	-0.031	11.800
2008M05	53.754	35.679	1.075	24.130	-0.031	14.000
2008M06	53.957	34.955	1.108	24.130	-0.031	16.300
2008M07	56.397	34.184	1.117	24.130	-0.031	19.800
2008M08	56.785	32.673	1.152	24.130	-0.031	24.600
2008M09	58.304	31.729	1.146	24.130	-0.031	24.600
2008M10	57.757	32.150	1.132	24.130	-0.031	24.700
2008M11	57.138	32.812	1.099	24.130	-0.031	24.700
2008M12	55.109	34.922	1.071	24.130	-0.031	24.700
2009M01	55.070	35.197	1.099	24.130	0.091	24.700
2009M02	54.556	35.425	1.140	24.130	0.091	24.700
2009M03	57.034	33.864	1.171	24.130	0.091	27.800
2009M04	57.970	32.573	1.169	24.130	0.091	25.700

Table continues

MONTH	PSCREDIT	DEBT	FINT	GDP	INSQUAL	TBRATE
2009M05	57.807	32.877	1.179	24.130	0.091	25.700
2009M06	58.311	32.337	1.196	24.130	0.091	25.800
2009M07	59.490	31.599	1.217	24.130	0.091	25.900
2009M08	57.195	33.559	1.216	24.130	0.091	25.900
2009M09	56.097	34.126	1.184	24.130	0.091	25.900
2009M10	55.139	34.622	1.143	24.130	0.091	25.800
2009M11	53.144	37.406	1.111	24.130	0.091	24.900
2009M12	49.633	41.358	1.157	24.130	0.091	22.500
2010M01	48.809	42.831	1.141	24.553	0.126	18.900
2010M02	47.930	43.750	1.163	24.553	0.126	17.200
2010M03	48.810	42.898	1.142	24.553	0.126	14.600
2010M04	47.624	43.811	1.157	24.553	0.126	13.400
2010M05	48.375	43.392	1.146	24.553	0.126	12.900
2010M06	47.816	42.388	1.172	24.553	0.126	13.300
2010M07	47.392	42.696	1.170	24.553	0.126	12.700
2010M08	47.291	43.391	1.168	24.553	0.126	12.700
2010M09	46.893	43.502	1.149	24.553	0.126	12.500
2010M10	44.874	44.433	1.181	24.553	0.126	12.400
2010M11	45.783	44.428	1.069	24.553	0.126	12.330
2010M12	45.737	44.342	1.053	24.553	0.126	12.250
2011M01	44.518	46.472	1.096	24.815	0.132	12.150
2011M02	41.790	48.442	1.121	24.815	0.132	12.120
2011M03	40.962	48.615	1.103	24.815	0.132	12.110
2011M04	41.061	48.605	1.119	24.815	0.132	12.050
2011M05	41.737	48.153	1.133	24.815	0.132	10.490
2011M06	43.935	45.804	1.147	24.815	0.132	10.570
2011M07	45.363	44.433	1.160	24.815	0.132	10.200
2011M08	45.033	44.220	1.155	24.815	0.132	9.370
2011M09	45.465	42.821	1.150	24.815	0.132	9.410
2011M10	47.325	41.294	1.108	24.815	0.132	9.130
2011M11	46.714	41.368	1.133	24.815	0.132	9.630
2011M12	47.522	42.231	1.093	24.815	0.132	10.670
2012M01	47.759	42.513	1.119	25.045	0.130	10.850
2012M02	48.092	41.639	1.131	25.045	0.130	11.340
2012M03	47.372	42.384	1.188	25.045	0.130	12.300
2012M04	47.238	42.132	1.172	25.045	0.130	13.970
2012M05	47.895	41.365	1.183	25.045	0.130	16.920
2012M06	48.437	40.054	1.186	25.045	0.130	22.443
2012M07	50.683	37.967	1.168	25.045	0.130	22.850
2012M08	50.474	38.095	1.169	25.045	0.130	22.850
2012M09	51.967	36.317	1.155	25.045	0.130	23.030

Table continues

MONTH	PSCREDIT	DEBT	FINT	GDP	INSQUAL	TBRATE
2012M10	49.790	38.436	1.160	25.045	0.130	23.090
2012M11	47.401	40.841	1.115	25.045	0.130	22.340
2012M12	46.373	43.014	1.101	25.045	0.130	22.900
2013M01	43.295	45.576	1.105	25.260	0.084	22.897
2013M02	45.673	43.154	1.105	25.260	0.084	22.998
2013M03	45.532	43.028	1.137	25.260	0.084	22.861
2013M04	45.175	43.471	1.126	25.260	0.084	22.968
2013M05	46.119	42.624	1.118	25.260	0.084	23.027
2013M06	48.121	41.888	1.132	25.260	0.084	23.060
2013M07	46.274	43.766	1.120	25.260	0.084	23.068
2013M08	43.333	43.716	1.128	25.260	0.084	22.858
2013M09	45.818	43.141	1.128	25.260	0.084	21.587
2013M10	44.799	43.638	1.106	25.260	0.084	20.290
2013M11	43.233	44.602	1.089	25.260	0.084	19.230
2013M12	46.808	43.241	1.117	25.260	0.084	18.800
2014M01	47.264	43.080	1.129	25.454	-0.007	19.463
2014M02	47.900	42.447	1.154	25.454	-0.007	20.378
2014M03	47.168	40.869	1.166	25.454	-0.007	22.893
2014M04	52.404	37.139	1.143	25.454	-0.007	24.043
2014M05	51.759	38.007	1.159	25.454	-0.007	24.066
2014M06	54.880	35.029	1.194	25.454	-0.007	24.071
2014M07	54.712	34.457	1.174	25.454	-0.007	24.646
2014M08	53.991	35.383	1.196	25.454	-0.007	25.009
2014M09	53.793	35.829	1.209	25.454	-0.007	25.337
2014M10	53.220	36.299	1.206	25.454	-0.007	25.681
2014M11	52.691	36.992	1.149	25.454	-0.007	25.727
2014M12	51.018	37.892	1.170	25.454	-0.007	25.791
2015M01	51.148	37.535	1.118	25.643	-0.031	25.832
2015M02	52.092	36.531	1.200	25.643	-0.031	25.622
2015M03	54.143	34.796	1.226	25.643	-0.031	25.552
2015M04	56.262	33.178	1.241	25.643	-0.031	25.179
2015M05	57.790	32.166	1.258	25.643	-0.031	25.050
2015M06	59.012	30.934	1.323	25.643	-0.031	25.170
2015M07	57.370	32.175	1.248	25.643	-0.031	25.202
2015M08	58.403	31.379	1.251	25.643	-0.031	25.218
2015M09	57.039	31.694	1.227	25.643	-0.031	25.285
2015M10	56.367	33.056	1.187	25.643	-0.031	25.328
2015M11	54.458	34.798	1.174	25.643	-0.031	24.498
2015M12	55.020	35.501	1.176	25.643	-0.031	23.120
2016M01	52.568	35.837	1.151	25.843	-0.031	22.729
2016M02	52.787	34.841	1.196	25.843	-0.031	22.668
2016M03	53.855	35.615	1.206	25.843	-0.031	22.616

Table continues

MONTH	PSCREDIT	DEBT	FINT	GDP	INSQUAL	TBRATE
2016M04	54.147	35.854	1.195	25.843	-0.031	22.765
2016M05	54.505	35.496	1.200	25.843	-0.031	22.788
2016M06	54.471	35.651	1.199	25.843	-0.031	22.802
2016M07	55.366	34.892	1.208	25.843	-0.031	22.771
2016M08	54.170	36.140	1.227	25.843	-0.031	22.771
2016M09	53.448	37.159	1.215	25.843	-0.031	22.867
2016M10	51.651	38.985	1.199	25.843	-0.031	22.761
2016M11	50.000	40.664	1.181	25.843	-0.031	20.873
2016M12	50.477	40.761	1.205	25.843	-0.031	16.814

Appendix B: Dataset for NIM Analysis

MONTH	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
2006M02	-0.055	7.980	-4.796	0.909	12.10	43.925	1.295	982.347	48.652	20.211	-0.072
2006M03	0.175	8.017	-4.796	0.910	9.90	43.259	1.948	956.756	47.230	20.555	-0.072
2006M04	0.164	8.263	-4.796	0.911	9.50	42.646	2.658	940.213	47.103	20.746	-0.072
2006M05	0.178	8.173	-4.796	0.912	10.20	42.864	3.257	944.537	48.673	21.420	-0.072
2006M06	0.167	7.873	-4.796	0.915	10.50	42.615	3.875	933.093	46.823	21.681	-0.072
2006M07	0.185	8.082	-4.796	0.916	11.40	42.589	4.523	929.077	48.232	21.965	-0.072
2006M08	0.185	8.435	-4.796	0.918	11.20	42.985	5.155	933.927	48.704	22.249	-0.072
2006M09	0.186	8.697	-4.796	0.920	10.80	42.641	5.746	916.037	49.248	22.716	-0.072
2006M10	0.191	8.631	-4.796	0.921	10.50	42.678	6.407	910.758	49.886	23.187	-0.072
2006M11	0.255	8.565	-4.796	0.921	10.30	42.713	7.346	906.446	50.485	23.364	-0.072
2006M12	0.185	8.580	-4.796	0.921	10.50	41.291	7.818	870.696	48.609	23.926	-0.072
2007M01	0.163	7.925	-4.890	0.921	10.89	41.353	0.704	862.511	48.994	19.335	-0.072
2007M02	0.140	7.718	-4.890	0.922	10.42	40.294	1.186	848.394	49.344	22.806	-0.072
2007M03	0.205	8.091	-4.890	0.925	10.19	40.235	1.842	831.778	50.179	23.733	-0.072
2007M04	0.101	8.060	-4.890	0.926	10.50	41.151	2.632	844.445	48.941	23.617	-0.072
2007M05	0.239	7.999	-4.890	0.925	11.02	39.497	3.071	809.396	47.585	24.194	-0.072
2007M06	0.141	8.065	-4.890	0.926	10.69	39.387	3.801	816.343	48.649	23.892	-0.072
2007M07	0.216	8.859	-4.890	0.927	10.14	39.854	3.782	823.480	49.939	29.099	-0.072
2007M08	0.175	9.618	-4.890	0.930	10.41	40.239	4.543	834.294	49.017	25.764	-0.072
2007M09	0.213	8.451	-4.890	0.935	10.19	40.329	5.577	831.390	50.610	26.090	-0.072
2007M10	0.197	8.607	-4.890	0.942	10.14	41.244	5.807	854.575	51.918	27.016	-0.072

Table continues

MONTH	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
2007M11	0.331	8.490	-4.890	0.952	11.40	40.989	6.557	840.506	51.815	28.195	-0.072
2007M12	0.050	9.123	-4.890	0.959	12.75	41.288	6.907	837.957	53.190	28.882	-0.072
2008M01	0.162	6.653	-6.549	0.969	12.81	41.243	0.658	834.587	52.637	22.160	-0.031
2008M02	0.165	6.969	-6.549	0.972	13.21	41.048	0.994	827.406	52.855	26.359	-0.031
2008M03	0.171	7.460	-6.549	0.977	13.79	40.406	1.676	820.828	54.790	27.266	-0.031
2008M04	0.159	7.049	-6.549	0.981	15.29	40.266	2.245	808.946	53.558	28.117	-0.031
2008M05	0.174	7.099	-6.549	0.993	16.88	40.516	3.084	817.461	54.739	27.096	-0.031
2008M06	0.195	7.046	-6.549	1.011	18.41	39.099	4.034	784.874	55.633	27.387	-0.031
2008M07	0.198	7.154	-6.549	1.040	18.31	40.612	4.669	811.800	56.318	27.657	-0.031
2008M08	0.198	6.883	-6.549	1.080	18.10	39.737	5.293	795.751	55.901	27.927	-0.031
2008M09	0.209	6.961	-6.549	1.109	17.89	39.301	5.843	789.068	55.328	28.685	-0.031
2008M10	0.167	7.437	-6.549	1.138	17.30	38.862	6.278	786.881	57.447	29.337	-0.031
2008M11	0.269	7.701	-6.549	1.165	17.44	37.728	7.107	752.949	58.072	29.455	-0.031
2008M12	0.219	8.596	-6.549	1.194	18.13	37.545	7.715	744.339	55.805	30.965	-0.031
2009M01	0.249	8.900	-6.813	1.240	19.86	37.292	0.663	752.990	55.067	33.725	0.091
2009M02	0.182	9.182	-6.813	1.307	20.34	36.894	1.284	746.619	56.524	34.165	0.091
2009M03	0.261	9.157	-6.813	1.352	20.53	36.984	1.811	749.474	58.452	36.534	0.091
2009M04	0.277	8.786	-6.813	1.384	20.56	37.872	0.905	764.271	58.797	36.826	0.091
2009M05	0.282	8.905	-6.813	1.410	20.06	36.709	3.224	746.432	57.975	36.600	0.091
2009M06	0.289	8.951	-6.813	1.442	20.74	35.937	3.969	732.053	58.048	36.987	0.091
2009M07	0.222	8.645	-6.813	1.461	20.50	34.894	4.223	704.819	56.668	40.194	0.091
2009M08	0.300	9.394	-6.813	1.471	19.65	34.183	5.221	695.426	56.644	37.283	0.091
2009M09	0.181	9.781	-6.813	1.460	18.37	35.225	5.923	710.175	55.423	37.561	0.091

Table continues

MONTH	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
2009M10	0.269	10.210	-6.813	1.454	18.04	34.395	6.513	693.982	53.350	38.166	0.091
2009M11	0.427	11.549	-6.813	1.443	16.92	34.835	6.962	693.351	53.140	40.183	0.091
2009M12	0.287	13.429	-6.813	1.435	15.97	34.849	7.789	692.593	49.282	39.968	0.091
2010M01	0.190	9.505	-6.515	1.429	14.78	34.071	0.668	685.817	49.554	26.386	0.126
2010M02	0.213	9.946	-6.515	1.430	14.23	34.026	1.129	675.513	49.383	31.021	0.126
2010M03	0.246	9.658	-6.515	1.427	13.32	33.959	1.831	670.343	46.991	30.731	0.126
2010M04	0.312	10.052	-6.515	1.422	11.66	33.484	2.444	667.202	47.344	31.099	0.126
2010M05	0.239	9.952	-6.515	1.421	10.68	33.453	2.990	663.147	47.090	31.141	0.126
2010M06	0.358	9.951	-6.515	1.423	9.52	32.185	3.716	630.994	47.749	30.979	0.126
2010M07	0.226	9.911	-6.515	1.432	9.46	31.465	4.238	626.420	46.791	31.728	0.126
2010M08	0.326	10.303	-6.515	1.434	9.44	31.443	5.082	623.613	47.504	31.167	0.126
2010M09	0.259	10.543	-6.515	1.433	9.38	31.384	5.780	624.707	47.365	31.331	0.126
2010M10	0.289	12.140	-6.515	1.431	9.38	29.026	5.442	592.515	45.642	37.244	0.126
2010M11	0.224	11.544	-6.515	1.434	9.08	31.047	6.904	613.072	45.999	32.285	0.126
2010M12	0.284	11.968	-6.515	1.445	8.58	30.379	7.349	599.958	45.953	33.756	0.126
2011M01	0.195	9.802	-4.005	1.465	9.08	31.541	0.546	626.119	44.771	29.650	0.132
2011M02	0.176	9.844	-4.005	1.509	9.16	31.088	1.128	622.095	41.569	29.700	0.132
2011M03	0.196	10.275	-4.005	1.517	9.13	30.007	1.694	605.193	41.151	30.275	0.132
2011M04	0.194	10.754	-4.005	1.518	9.02	31.543	2.162	622.599	38.000	31.804	0.132
2011M05	0.213	10.757	-4.005	1.507	8.90	30.139	2.795	602.142	39.158	31.066	0.132
2011M06	0.198	10.456	-4.005	1.506	8.59	30.331	3.427	603.215	39.776	31.327	0.132
2011M07	0.203	10.162	-4.005	1.508	8.39	30.677	4.166	606.852	40.785	30.545	0.132
2011M08	0.188	10.176	-4.005	1.511	8.41	29.618	4.661	596.729	41.442	30.641	0.132

Table continues

MONTH	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
2011M09	0.232	10.009	-4.005	1.524	8.40	30.590	5.210	605.999	41.351	31.915	0.132
2011M10	0.246	9.535	-4.005	1.547	8.56	30.541	5.808	605.662	41.626	32.202	0.132
2011M11	0.185	10.037	-4.005	1.561	8.55	30.570	6.260	604.363	42.391	32.862	0.132
2011M12	0.210	10.754	-4.005	1.574	8.58	30.069	6.827	590.079	42.397	32.789	0.132
2012M01	0.207	8.935	-11.483	1.615	8.73	29.507	0.605	583.806	43.293	29.575	0.130
2012M02	0.147	8.768	-11.483	1.671	8.64	30.398	1.070	592.926	43.921	30.028	0.130
2012M03	0.201	9.409	-11.483	1.700	8.78	29.897	1.647	597.486	45.874	29.900	0.130
2012M04	0.193	9.213	-11.483	1.762	9.11	30.318	2.189	605.284	44.495	30.440	0.130
2012M05	0.208	9.390	-11.483	1.841	9.34	30.733	2.770	605.063	45.268	30.763	0.130
2012M06	0.179	9.189	-11.483	1.884	9.44	32.672	3.309	646.856	45.409	30.706	0.130
2012M07	0.215	8.894	-11.483	1.915	9.54	32.793	3.911	646.018	47.916	30.490	0.130
2012M08	0.230	9.220	-11.483	1.926	9.46	33.165	4.470	652.137	49.269	30.834	0.130
2012M09	0.241	8.812	-11.483	1.908	9.43	32.937	4.964	650.918	50.407	31.498	0.130
2012M10	0.281	9.700	-11.483	1.893	9.24	32.620	5.530	641.537	49.547	31.940	0.130
2012M11	0.280	10.669	-11.483	1.903	9.31	31.664	6.137	624.433	48.188	32.151	0.130
2012M12	0.328	11.550	-11.483	1.884	8.84	31.955	6.586	623.099	47.809	33.154	0.130
2013M01	0.236	10.143	-9.921	1.896	10.09	31.877	0.558	629.462	48.461	28.961	0.084
2013M02	0.221	9.710	-9.921	1.905	10.40	32.307	1.089	638.631	48.325	29.541	0.084
2013M03	0.256	9.875	-9.921	1.924	10.78	31.330	1.583	627.084	47.736	32.084	0.084
2013M04	0.248	10.151	-9.921	1.946	10.87	32.169	2.253	637.965	47.049	30.374	0.084
2013M05	0.255	10.341	-9.921	1.962	11.02	30.914	2.797	620.338	49.076	30.853	0.084
2013M06	0.274	10.544	-9.921	1.986	11.63	30.536	3.379	615.744	49.926	31.036	0.084
2013M07	0.256	11.497	-9.921	1.991	11.79	30.780	3.771	626.038	48.532	32.379	0.084

Table continues

MONTH	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
2013M08	0.325	11.663	-9.921	1.994	11.45	30.265	4.381	614.978	47.696	32.667	0.084
2013M09	0.289	11.724	-9.921	1.998	11.95	31.194	4.963	636.406	46.607	32.837	0.084
2013M10	0.297	12.131	-9.921	2.007	13.09	30.104	5.517	613.239	46.722	33.198	0.084
2013M11	0.297	12.795	-9.921	2.060	13.22	30.426	6.077	618.049	46.503	33.430	0.084
2013M12	0.323	12.783	-9.921	2.111	13.50	30.395	6.565	617.285	47.076	34.093	0.084
2014M01	0.270	10.873	-10.191	2.291	13.80	30.838	0.537	625.895	47.738	32.058	-0.007
2014M02	0.259	11.040	-10.191	2.438	14.00	30.623	1.083	613.904	47.089	33.263	-0.007
2014M03	0.306	10.847	-10.191	2.583	14.50	30.286	1.646	606.354	48.554	33.900	-0.007
2014M04	0.285	9.686	-10.191	2.740	14.70	30.142	2.163	615.388	49.005	34.632	-0.007
2014M05	0.298	10.262	-10.191	2.863	14.80	30.166	2.679	614.777	49.731	35.300	-0.007
2014M06	0.309	9.595	-10.191	2.982	15.00	29.230	3.220	595.119	50.272	35.861	-0.007
2014M07	0.321	9.474	-10.191	3.019	15.30	28.702	3.796	585.459	50.170	36.081	-0.007
2014M08	0.345	10.254	-10.191	3.065	15.90	28.472	4.474	587.721	49.492	36.091	-0.007
2014M09	0.368	10.710	-10.191	3.182	16.50	28.001	5.099	575.703	49.779	36.353	-0.007
2014M10	0.370	11.067	-10.191	3.196	16.90	28.508	5.654	583.722	48.449	37.107	-0.007
2014M11	0.364	11.559	-10.191	3.197	17.00	27.393	6.072	571.110	48.500	38.638	-0.007
2014M12	0.384	11.789	-10.191	3.197	17.00	26.498	7.035	551.899	46.857	38.201	-0.007
2015M01	0.341	9.649	-6.891	3.218	16.40	26.800	0.553	559.094	47.390	34.773	-0.031
2015M02	0.274	9.651	-6.891	3.361	16.50	26.548	1.156	548.338	47.202	35.466	-0.031
2015M03	0.275	9.576	-6.891	3.591	16.60	26.698	1.784	553.484	48.806	35.313	-0.031
2015M04	0.374	9.153	-6.891	3.812	16.80	26.609	2.337	555.279	49.901	36.748	-0.031
2015M05	0.333	8.984	-6.891	3.893	16.90	26.580	2.953	550.692	50.191	36.536	-0.031
2015M06	0.363	9.063	-6.891	4.186	17.10	26.429	3.436	546.004	50.867	38.543	-0.031

Table continues

MONTH	NIM	DEBT	DEF	EXCHR	INF	CONCEN	EFF	HHI	RISK	SIZE	RQUAL
2015M07	0.319	8.789	-6.891	3.532	17.90	26.692	3.969	551.859	50.925	39.490	-0.031
2015M08	0.346	9.000	-6.891	3.859	17.30	26.627	4.644	546.528	50.042	38.972	-0.031
2015M09	0.350	8.996	-6.891	3.782	17.40	26.269	5.188	536.599	50.199	39.459	-0.031
2015M10	0.355	9.777	-6.891	3.764	17.40	25.888	5.724	535.511	49.017	40.036	-0.031
2015M11	0.318	10.596	-6.891	3.790	17.60	25.490	6.234	529.945	48.199	40.476	-0.031
2015M12	0.529	11.179	-6.891	3.795	17.70	24.545	7.081	512.448	47.494	40.710	-0.031
2016M01	0.290	9.413	-7.856	3.806	18.99	24.736	0.549	514.803	47.938	35.913	-0.031
2016M02	0.287	9.007	-7.856	3.871	18.47	24.896	1.127	519.856	48.072	36.734	-0.031
2016M03	0.314	9.331	-7.856	3.851	19.22	25.217	1.696	520.860	46.760	36.921	-0.031
2016M04	0.316	9.652	-7.856	3.820	18.71	25.572	2.271	524.400	47.841	37.043	-0.031
2016M05	0.330	9.748	-7.856	3.811	18.89	25.096	2.857	521.768	47.458	37.252	-0.031
2016M06	0.384	10.050	-7.856	3.882	18.40	24.405	3.421	503.202	48.819	37.779	-0.031
2016M07	0.307	9.703	-7.856	3.939	16.70	23.808	4.057	501.667	47.863	37.338	-0.031
2016M08	0.315	10.339	-7.856	3.945	16.90	24.433	4.623	519.338	48.315	37.679	-0.031
2016M09	0.329	10.877	-7.856	3.956	17.20	25.143	5.227	523.498	47.640	38.137	-0.031
2016M10	0.353	11.914	-7.856	3.967	15.80	24.493	5.825	517.887	45.966	38.835	-0.031
2016M11	0.407	12.950	-7.856	3.972	15.50	24.432	6.417	515.192	44.441	39.595	-0.031
2016M12	0.415	13.432	-7.856	4.097	15.40	23.994	6.864	497.212	43.074	42.278	-0.031

Appendix C: Results of ARDL Analysis for PSCREDIT

Dependent Variable: PSCREDIT
Method: ARDL
Date: 10/25/17 Time: 18:43
Sample (adjusted): 2006M05 2016M12
Included observations: 128 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): DEBT FINT(-1) GDP INSQUAL TBRATE
Fixed regressors: C
Number of models evaluated: 12500
Selected Model: ARDL(1, 1, 0, 0, 3, 1)

Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
PSCREDIT(-1)	0.418184	0.079382	5.268001	0.0000
DEBT	-0.90953	0.049252	-18.46701	0.0000
DEBT(-1)	0.338745	0.094218	3.595336	0.0005
FINT(-1)	3.453523	2.153556	1.603637	0.1115
GDP	-0.405341	0.160574	-2.524322	0.0129
INSQUAL	-1.833795	4.228972	-0.433627	0.6654
INSQUAL(-1)	-0.765759	5.781284	-0.132455	0.8949
INSQUAL(-2)	13.49904	5.755393	2.345459	0.0207
INSQUAL(-3)	-12.73471	4.203694	-3.02941	0.003
TBRATE	-0.156803	0.05919	-2.64916	0.0092
TBRATE(-1)	0.147196	0.056539	2.603462	0.0104
C	58.18789	8.474535	6.866204	0.0000

R-squared	0.981575	Mean dependent var	50.10312
Adjusted R-squared	0.979828	S.D. dependent var	4.823689
S.E. of regression	0.685097	Akaike info criterion	2.170548
Sum squared resid	54.44553	Schwarz criterion	2.437925
Log-likelihood	-126.915	Hannan-Quinn criteria.	2.279185
F-statistic	561.8093	Durbin-Watson stat	1.928993
Prob(F-statistic)	0.0000000		

Note: p-values and any subsequent tests do not account for model selection

Appendix D: Results of ARDL Analysis for NIM

Dependent Variable: NIM
Method: ARDL
Date: 01/21/18 Time: 21:22
Sample (adjusted): 2006M06 2016M12
Included observations: 127 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): DEBT(-1) DEF EXCHR INF CONCEN EFF RISK SIZE RQUAL
Fixed regressors: C
Number of models evaluated: 7812500
Selected Model: ARDL(1, 3, 0, 0, 0, 4, 3, 0, 4, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NIM(-1)	-0.336792	0.087791	-3.83627	0.0002
DEBT(-1)	0.014292	0.008265	1.729239	0.0868
DEBT(-2)	0.023035	0.010381	2.219037	0.0287
DEBT(-3)	0.003498	0.009739	0.359224	0.7202
DEBT(-4)	-0.016166	0.007326	-2.20667	0.0296
DEF	0.000726	0.002144	0.338674	0.7356
EXCHR	0.089497	0.01961	4.563841	0.0000
INF	-0.004903	0.002589	-1.89418	0.0610
CONCEN	-0.016704	0.005306	-3.14825	0.0022
CONCEN(-1)	0.008632	0.0062	1.392136	0.1669
CONCEN(-2)	0.007213	0.00643	1.121779	0.2646
CONCEN(-3)	-0.000807	0.006067	-0.13295	0.8945
CONCEN(-4)	0.01034	0.005351	1.932344	0.0561
EFF	0.004991	0.002515	1.984751	0.0499
EFF(-1)	0.006235	0.003282	1.89985	0.0603
EFF(-2)	-0.004221	0.003379	-1.24898	0.2145
EFF(-3)	-0.003881	0.00272	-1.4266	0.1568
RISK	0.005074	0.002384	2.127853	0.0358
SIZE	0.008604	0.002379	3.616583	0.0005
SIZE(-1)	-0.000843	0.003031	-0.27798	0.7816
SIZE(-2)	-0.006751	0.003082	-2.19031	0.0308
SIZE(-3)	-0.003446	0.003025	-1.13927	0.2573
SIZE(-4)	8.67E-03	0.002438	3.557524	0.0006
RQUAL	0.090602	0.124142	0.729832	0.4672
C	-0.757357	0.175976	-4.30374	0.00000

Table continues

R-squared	0.811112	Mean dependent var	0.2577
Adjusted R-squared	0.766667	S.D. dependent var	0.074973
S.E. of regression	0.036215	Akaike info criterion	-3.62418
Sum squared resid	0.133779	Schwarz criterion	-3.0643
Log likelihood	255.1352	Hannan-Quinn criteria	-3.3967
F-statistic	18.250050	Durbin-Watson stat	2.064951
Prob(F-statistic)	0.00000		

*Note: p-values and any subsequent tests do not account for model selection.