Evaluating Bank Profitability in Ghana: A five step Du-Pont Model Approach

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Abstract
We investigate bank profitability in Ghana using periods before, during and after the globe financial crises with the five step du-pont model for the first time. We adapt the variable of the five step du-pont model to explain bank profitability with a panel data of twenty-five banks in Ghana from 2006 to 2012. To ensure meaningful generalization robust errors fixed and random effects models are used. Our empirical results suggests that bank operating activities (operating profit margin), bank efficiency (asset turnover), bank leverage (asset to equity) and financing cost (interest burden) were positive and significant determinants of bank profitability (ROE) during the period of study implying that bank in Ghana can boost return to equity holders through the above mentioned variables. We further report that the five step du-pont model better explains the total variation (94%) in bank profitability in Ghana as compared to earlier findings suggesting that bank specific variables are keen in explaining ROE in banks in Ghana. We cited no empirical study that has employed five step du-pont model making our study unique and different from earlier studies as we assert that bank specific variables are core to explaining bank profitability.

Key Words: Du-Pont Model; Return On Equity; Operating Profit Margin; Asset Turnover; Leverage; Interest Burden; Tax Effects; Bank Profitability.

JEL classification: G2

Introduction
Over the last two decades banks have been under serious scrutinizing and attracted the considerable attention among academics and practitioners (Fujii, Managi and Matousek, 2014). This is due to the fact that banks play crucial and fundamental roles in various economies which may lead to the break or make of those economies (Crotty, 2008, Mauds and Pastor, 2001). Through the functions performed by banks which include mobilization of savings, evaluation of projects and resource allocation, management of risk, monitoring of managers and facilitation of transactions, banks are exposure to various types of risk and the most pertinent among them is credit risk exposure.
(Castro, 2013; Chaibi and Ftiti, 2015; Louzis, 2012). Also Karbo and Adamu (2009) and Becks and Levine (2004) suggest that profitable banks are less likely to face huge credit risk exposures.

In many countries today, banking system plays a vital role in the development of the economy and Ghanaian economy is no exception. Financial Institutions also play essential part in economic development and growth. For instance, banks ensure efficient money and capital markets allocation, while enhancing the general growth of the economy (Schumpeter, 1911; Becks and Levine, 2004). Financial institutions perform the role of financial intermediation by collecting and mobilising resources to finance business and development projects that are essential for economic development (Bittencourt, 2010; Karbo and Adamu, 2009; Gumra, 2009; Bekuert et al., 2005) and also make profit from the process. That is banking financial institutions are economic agents that strive for profit mainly from interest income through the lending proposition. Behr and Sonnekalb (2012) suggest that higher loan servicing performance leads to higher bank profitability. Hence, banks that are profitable are able to recover majority of their loans and are less likely to face huge credit risk exposures. In other words profit is inversely related to credit risk (Crotty, 2008; Castro, 2013; Behr and Sonnekalb, 2012; Louis, 2012; Chaibi and Ftiti, 2015).

In Ghana, the banking industry profitability (ROE) shows a declining trend in recent years (2003 - 2013) despite increase in deposits and branch network (Ghana Banking Survey Report, 2010). The increase in deposits is expected to permit the banks to lend more and make more profit through interest income but this profit expectation has not materialized. In the light of this, the study investigates profitability before, during and after the global financial crises (2006-2012) in the Ghanaian banking industry using the five step du-pont model which is less used in empirical studies. The study employ the five step du-pont model to distinguish itself from existing studies as existing ones have mainly employed bank specific and macroeconomic variables or either of them. From instance, Demirgüç and Hinzinger (1998), Al-Haschimi (2007), Mlachila (2004) and Athanasoglou et al., (2005) have all employed firm specific and macro variables to investigate the drivers of profitability. To the best of our knowledge, the study does not cite any paper that has employed the five step du-pont model in an empirical study. Hence, the study contributes to bank profitability literature by using the five step du-pont model for the first time and also incorporating deposit in the model to establish its impact on ROE.

Overview of the Ghanaian Banking Industry

Banking in Ghana has undergone several reforms and developmental phases over time all geared towards improving banking or financial institutions operation. These reforms as per Ghana Banking Survey (2008 and 2009) includes the Banking Law, 1989 (P.N.D.C.L. 225), Bank of Ghana Act, 2002, Act 612, Universal Banking License was introduced, the Banking Act, 2004a,b (Act 673),Foreign Exchange Act 2006 (Act723), whistle blowers Act 2006(Act 720), secondary reserve requirement (15%) was abolished, the Banking Amendment Act 2007 (Act 783), Credit Reporting Act 2007 (726), redenomination of the Cedi, National Reconstruction levy abolishment, Non-Bank Financial Institution Act, 2008 (Act 774) Home Mortgage Finance Act (Act 770), Borrowers and Lenders Act (Act 773) and Anti-money Laundering Act (Act 749), introduction of cheque code-line clearing system and meeting of minimum capital requirement by foreign banks were the key milestones achieved in 2009.

Amidu (2007) suggest that, the banking system in Ghana has not seen much progress and developments in spite of the rigorous legislative and regulatory instruments. As a result, the Bank for Housing and Construction, Ghana Co-operative Bank, and the Bank for Credit and Commerce were all liquidated in the year 2000. One conclusion that can be drawn from the above is that, legislative and regulatory instruments in the banking sector of Ghana are needed to strengthened and safeguard the survival of the banks. Furthermore, effective risk management practices and prudent financing decision are also required for optimal financial performance of the banks, all else equal.

In reaction to the above, the Banking Act of 2004 was introduced in Ghana to mirror Basel II and repealed the Banking Law of 1989. Banking regulators in Ghana believed that compliance with this new legislative instrument, the Banking Act of 2004 (Act 673) together with the provisions under the Companies Code of 1963 (Act 179) would bring orderliness and strengthen the banking services industry in Ghana. Consequently, this would reduce or eradicate bank failures, increase performance and boost customer confidence in the Ghanaian banking system.
The Banking Amendment Act (2007), Act 738, replaced the Banking Act (2004) with an additional function of ensuring the soundness and stability of the financial system in Ghana and also the establishment of offshore banking and other offshore financial services such as insurance and leasing with a focus of positioning Ghana as the regional hub for financial activities in Africa and to attract diaspora investments. The Cedi redenomination cannot go unnoticed in 2007. The redenomination was to foster trade in conveniently carrying money and easy long queues in the banking hall. In this year the credit reporting act was passed to enable banks and other financial institutions share information on borrowers in the quest to reduce information asymmetry which is perceive to be the cause of huge nonperforming loans. The Borrowers and Lenders Act (Act 773) is to ensure high level disclosure in creditor and borrower relations. It aims to give clarity to lending conditions and rights and obligations of lenders and borrowers. Non Bank Financial Institution Act (Act 774) is to provide a framework to provide effective prudential regulation and supervision of the wide range of nonbank financial institutions. Home Mortgage Finance Act (Act 770) is to regulate home mortgage financing and applies to transactions between financial institutions and their customers (mortgagor) to finance the construction, purchase, completion, extension or renovation of residential property either for ownership, sale or rental. Anti-money Laundering Act (Act 749) seeks to prohibit money laundering and establish a Financial Intelligence Centre. Under the Act, a person commits the offence of money laundering if they knowingly convert, conceal, disguise, transfer, take possession of, or use property forming part of the proceeds of unlawful activity. 2009 also saw the introduction of the Cheque Code-line Clearing System which is to shorten the number of days cheques used for payments are settled. The Ghana Inter-Bank Payment and Settlement Systems (GhIPSS) introduced the “cheque code-line clearing system”. This system seeks to clear all cheques throughout the country within 48 hours, instead of the three days to three weeks. The improved efficiency in clearing is expected to encourage the use of cheques and reduce the use of cash. As evidenced from the above mentioned developments and reforms, most of the regulations have sought to ensure adherence to best banking practices and consequently a “risk free” banking system in Ghana.

In conclusion, the Ghanaian banking industry is relatively small consisting of 27 banks as of May, 2014. Of this number, fourteen are foreign banks (banks with foreign majority ownership) and thirteen local banks (banks with local majority owner). The banking system is based on the concept of universal banking where banks can offer all banking services. Some specialized banks have sprung up in the past only to be metamorphosed into universal banks. The phenomenal growth in the industry, coupled with expansion in branch network, and reinjection of capital across the spectrum of the industry have not succeeded in reducing the high interest rates. The industry still operates in a high interest rate regime despite attempts by Bank of Ghana in reducing the policy rate to which the interest rates have been pegged.

Literature Review

The Du-Pont Model

The application of financial ratios by financial analysts, lenders and academic researchers has gained much attention in literature (Osteryoung & Constand, 1992; Devine & Seaton, 1995; or Burson, 1998). The concepts of Return on Assets (ROA) and Return on Equity (ROE) are important for understanding the profitability of a business corporation. Particularly, the two ratios demonstrate the relationship between profits and the investment (funds) needed to generate those profits. Slater and Olson (1996) suggest that these concepts are often “too far removed from normal activities” to be easily understood and useful to many managers.

In 1918, four years after F. Donaldson Brown was hired by the Du Pont Corporation to work in its treasury department, the electrical engineer (F. Donaldson Brown) was given the task of unraveling the finances of General Motors of which Du Pont had just purchased 23 percent of its stock. Brown recognized a mathematical relationship that existed between two commonly computed ratios, namely net profit margin (obviously a profitability measure) and total asset turnover (an efficiency measure), and ROA. At the time, ROA maximization was a common corporate goal and the recognition that ROA was impacted by both profitability and efficiency led to the improvement of a system of planning and control for all operating decisions in a firm (Blumenthal, 1998). This is expressed in a ratio from below:

Eq. 1: \( \frac{\text{net income}}{\text{sales}} \times \frac{\text{sales}}{\text{total assets}} = \frac{\text{net income}}{\text{total assets}} \) i.e. ROA
In the 1970s was where the generally accepted goal of financial management became “maximizing the wealth of the firm’s owners” (Gitman, 1998) and the focal point shifted from ROA to ROE. This led to the foremost major alteration of the original Du Pont model. In addition, the way in which a firm financed its activities (leverage) was included with profitability and efficiency to derive ROE. At this time the use of leverage became a third area of interest for financial managers. The new du-Pont model called the three stage Du-Pont Model was expressed as:

**Eq. 2: (net income / sales) x (sales / total assets) x (total assets / equity) = ROE**

The Three step Du Pont model became a standard in all financial management textbooks and a powerful tool to illustrate the interconnectedness of a firm’s income statement and its balance sheet, and to develop straight-forward strategies for improving the firm’s ROE.

However, Hawawini and Viallet (1999) offered yet another modification to the Du Pont model. This modification resulted in five different ratios that combine to form ROE. In their modification they concede that the financial statements firms put together for their annual reports (which are of most importance to creditors and tax collectors) are not always useful to managers making operating and financial decisions (Brigham and Houston, 2001). Hawawini and Viallet (1999) restructured the traditional balance sheet into a “managerial balance sheet” which is “a more appropriate tool for assessing the contribution of operating decisions to the firm’s financial performance.” A more detailed explanation of the managerial balance sheet is illustrated as the five step Du-Pont Model:

**Eq. 4: ROE = (EBIT / sales) x (sales / invested capital) x (EBT / EBIT) x (invested capital / equity) x (EAT / EBT).**

In conclusion the five step du pont model decomposes return on equity in to five ratios overcoming the shortcomings of the three step du pont model. The three-step DuPont Model provides us with insights as to what is driving a company’s profit (return on equity) (Nissim and Penman, 2001, Fairfield and Yohn 2001; Ross et al., 1996). The three step du pont reveals how a company boosts its ROE by improving its profitability; using its assets more efficiently and taking on additional leverage (Moyer et al., 2007, Ross et al., 2008). However, companies that boost ROE by adding leverage will eventually reach a point where the cost of debt will diminish profit margins and decrease asset turnover. This observation is not captured by the three step du pont. Hence the five step du-pont model explains profitability as accruing from operating activities (OPM), efficiency (ATO), debts to assets (leverage), cost of funding (interest burden) and tax effect.

This limitation highlighted above with the three-step model led to the development of an expanded, five-step model of DuPont analysis, which breaks down the net profit margin even further to assess the impact of higher borrowing costs associated with increased leverage. The five step du pont argue that, if companies have high cost of borrowing, their interest expense on more debt could offset the positive effects of increased leverage. In addition, interest expenses for most companies are tax-deductible, so the extended model considers interest charges and the company’s tax burden (Soliman, 2008; Richardson et al., 2006; Ross et al., 2008; McClure, 2005).

**Empirical Review**

Romer (1986) contends that knowledge is easily diffused and transferred throughout an economy, making returns based on knowledge based assets transitory and diminishing. In this setting, to the degree that the source of profit margin is derived from ideas that can be imitated by others, it is more likely to be more transitory. Moreover, Romer (1986) concludes that returns derived from capital are more persistent because of the larger frictions to the movement of capital through an economy.

Ohlson (1995) and Feltham and Ohlson (1995) highlights the theoretical importance of ROE in the implementation of valuation models in general, and in the residual income model in particular. Standard DuPont analysis decomposes ROE into the three multiplicative ratios of Profit Margin, Asset Turnover, and Leverage. Penman (2001) shows that despite the fact that, ROE can be mechanically increased through leverage (assuming positive spread), the increase in the discount rate results in no change in equity value.

Fairfield and Yohn (2001) were the first to address the question of future predictive power and find that ATO is positively associated with future changes in return on net operating assets (RNOA), but that level of PM and ATO have no predictive value. This result is intuitive because the levels of PM and ATO are more informative toward a firm’s operating structure or industry membership (Ge and Soliman 2007). Further, increases in ATO indicate that the
firm’s ability to generate sales from a given investment has increased and that this is an indicator of future efficiency of generating sales from assets. Thus, this type of increase in profitability tends to persist.

Gill (1994) stresses the importance of monitoring the “financial health” of a small business. Thus, it would be useful for small business owners to have a relatively simple tool for not only assessing how their businesses are faring, but also for devising strategies for bottom line improvement. Such a tool exists in the form of an updated version of the classic Du Pont model.

As Moss, Mishra and Dedah (2009) state “the DuPont expansion is an artifact of the conglomerate movement of corporate entities. Originally, the DuPont Corporation used the DuPont expansion to analyze the performance of its ventures. Collins (1985) used a general form of the DuPont expansion to develop a model of optimal debt which emphasizes the choice of equity”.

In order to more effectively evaluate operational managers, Nissim & Penman (2001) suggest using a modified version of the traditional DuPont model in order to eliminate the effects of financial leverage and other factors not under the control of those managers. Using operating income to sales and asset turnover based on operating assets limits the performance measure of management to those factors over which management has the most control. The modified DuPont model has become widely recognized in the financial analysis literature. See, for example, Pratt & Hirst (2008), Palepu & Healy (2008), and Soliman (2008).

Conrad (1984) investigated that return of equity or capital is equally important for nonprofit organization by using data of American Hospital Association from 1971-1977. Return on equity, competitive pricing approach and CAPM are considered. The result shows that reasonable returns on equity are necessary for nonprofit organization. Ghosh & Jain (1998) investigated boost in leverage be the reason of merger by using almost 250 mergers accomplished linking for the year of 1978-1987. Mergers; Financial leverage; Debt capacity are considered. Regression techniques have been used. The result shows that financial leverage of combine firm is high as compare to other.

Liesz (1999) investigated that the failure of small business is always a debate topic by using the financial statement of small firms. OPM, Equity turnover, cost ratio, structure ratio, and tax ratio are considered. DuPont techniques have been used. The result shows that poor financial planning and control rank are the reason of business failure. Darmika (2008) investigated that this study examine the comparison of firms which successfully invest in I.T as compare to firms which cannot successfully invest in I.T by using Swa Sembada and Warta Ekonomi magazine, stock market website and library information. Information technologies, Competitive advantage, DuPont Analysis, Return on assets are considered. Normality test techniques have been used. The result show that which firms successfully invest in I.T have far better performance as compare to rival firm.

Weeden and Langemeier (2008) investigated that the performances of different age farmers by using continuous data 2002 to 2006. Profit margin, asset turnover, financial leverage, ROE and capital gain are considered. T test techniques have been used. The result show that performance of older farmer was lowest than younger farmers. Little et al. (2009) investigated that is to compare the performance of retail firms by using to select 111 retail firms for years 2006-2009.

Retail strategy, recession, differentiation, cost leadership, DuPont methods are considered.

ANOVA techniques have been used. The result shows that differentiation firms (profit margin is high and asset turnover is low) outperform cost leadership firm (profit is low and asset turnover is high).

Moss et al. (2009) investigated that the effect of ROE on Agricultural by using USDA data for 1960 to 2004. Profit margin, asset turnover and financial leverage are considered. Correlation techniques have been used. The result shows that ROE effect of regional and national level. Escudero (2009) investigated that the relation between CEO salary and firm performance by using 210 CEO’s salary data from 1990. Firm performance, CEO’s salary and ROE are considered. Least square method has been used. The result shows that there is weak relationship between CEO’s salary and performance. Collins et al. (2010) investigated that the influence of profit margin on firm business model in the US industry by using data from US airlines. Profit margin pushiness, business models, U.S.A aviation business are considered. Regression techniques have been used. The result shows that low cost carrier is more profitable than network carrier.
Selvarasu et al. (2010) investigated those strategies for humanizing the performance of a medium volume Indian Apparel Company by using annual and financial report of 2007. ROE, profit margin, asset turnover and financial leverage are considered. SPM techniques have been used.

The result show that company success depend upon two things increase sale and decrease expense and cash. Herciu et al. (2011) investigated that most profitable companies are not necessarily most attractive for investors by using annual reports of 20 companies of 2009. Profit margin, ROE, ROS, ROA, financial leverage and DuPont model are considered. DuPont mode l techniques have been used. The result is showing that the ranking rely on this factors like ROE, ROS, ROA and financial leverage.

Raza et al. (2011) investigated that strength of CAPM by using data of three eighty seven companies. Risk, CAPM and Decision making are considered. Pair t- test techniques is use. The result shows that CAPM is useful for short term investment. The finding of this research paper is,

CAPM should use for short term investment decision. Abdoli et al. (2011) investigated that about the comparison DEA and DuPont model by using 13 financial ratios. AHP, DEA and DuPont model are considered. Correlation techniques have been used. The result shows that there is weak correlation between DEA and DuPont model. Alaghi (2011) investigated that effect of financial leverage on systematic risk by using data of listed companies of Tehran stock exchange. Financial leverage, capital structure, systematic risk, operating leverage, earnings per share (EPS), and earnings before interest and taxes (EBIT) are considered. Regression techniques have been used. The result shows that financial leverage on systematic risk.

Research and Methodology

Panel data methodology is an important method of longitudinal data analysis. In this study, this methodology has been adopted because of the potential it has in effectively addressing the objectives of the study. It is therefore clear that the methodology employed in this work is quantitative and of panel data form. According to Baltagi (2005), panel data involves the pooling of observations on a cross-section of units over several time periods and provides results that are simply not detectable in pure cross-sections or pure time-series studies. He argues that panel data is more useful than either cross-section or time-series data alone due to the following reasons;

- Panel data offers more enlightening data, more variability, less collinearity among variables, more degrees of freedom and more efficiency.
- It controls for individual heterogeneity due to hidden factors.
- Better ability to study dynamics of adjustments.
- Better ability to identify effects that are simply not detectable in pure cross-section or pure time-series data.
- Enable researchers to construct and test more complicated behavioural models than cross-section or time-series data.

The theoretical and empirical literature in corporate finance on the five step du-pont model identifies operating profit margin (OPM), capital turnover (CTO), financial cost or interest burden ratio (FCR), financial structure or leverage ratio (FSR) and tax effect ratio (TER) as the factors that influence profitability (ROE). The factors influencing bank profitability in Ghana is estimated in the following regression models:

\[
Y_{it} = \alpha_0 + \beta_1 \text{OPM}_t + \beta_2 \text{ATO}_t + \beta_3 \text{LR}_t + \beta_4 \text{BB}_t + \beta_5 \text{TAXEFFI}_t + \mu_{it} \quad \text{Model (1)}
\]

\[
Y_{it} = \alpha_0 + \beta_1 \text{BD}_t + \beta_2 \text{BB}_t \sum \gamma \text{CONTROLS}_t + \mu_{it} \quad \text{Model (2)}
\]

Where \(Y_{it}\) represents both return on equity measured as the ratio of profit after taxes to shareholders equity of a bank at a point in time. Bank profitability is explained by OPM, CTO, FCR, FSR and TER. The subscripts \(t\) and \(t\) represents a bank at a particular time respectively. OPM (operating profit) is measured as earnings before interest and tax divided by sales (EBIT/ SALES). ATO (efficiency) is also measured as sales divided by invested capital while LR (Leverage) is measured as invested capital divided by equity capital. IB (Interest burden) measures the interest burden or financial cost and calculated as earnings before interest and tax divided by earnings before tax while TAXEFFI
(Tax benefit or Shield) measures the effect of tax and also calculated as earnings after tax divided by earnings before tax. BD (Bank Deposit) is measured as bank deposits divided by total assets while BB (Bank Branches) is measured as the natural log of each bank branches in a year. $\beta_1$ to $\beta_5$ represent coefficients of the explanatory factors while $\alpha_0$ denotes the constant of the model. $\mu_{it}$ is a three way error structure defined below:

$$\mu_{it} = \gamma_i + \varepsilon_i + \gamma_t$$

$\varepsilon_i$ is bank unobserved effects; $\gamma_i$ is time specific unobserved effect and $\gamma_t$ is the idiosyncratic error term. Since the du-pont model is a multiplicative model of five ratios (stated above), we take their natural logs of the ratios in order to make the model linear as proposed by Wooldridge (2009) and Baltagi (2005) so as to enable the use of a panel regression data approach.

### Table 1: Summary of Variables

| Variables               | Symbol | Measurement                                      | Data Source                  |
|-------------------------|--------|--------------------------------------------------|------------------------------|
| Operating Profit Margin | OPM    | earnings before interest and tax divided by sales | Computation on data from BoG |
| Assets Turnover         | ATO    | sales divided by invested capital                | Computation on data from BoG |
| Leverage Ratio          | LR     | invested capital divided by equity capital       | Computation on data from BoG |
| Interest Burden         | IB     | earnings before interest and tax divided by earnings before tax | Computation on data from BoG |
| Tax Effect              | TAXEFF | earnings after tax divided by earnings before tax | Computation on data from BoG |
| Bank Deposit            | BD     | Bank deposits divided by total assets            | Computation on data from BoG |
| Bank Branches           | BB     | Natural log of bank branches                     | Computation on data from BoG |

### Empirical Data and Analysis

Estimation of panel data models using pooled Ordinary Least Squares (OLS) yields inconsistent estimators and heteroskedasticity errors. Furthermore, if the parameters to be estimated differ across firms and/or over time, then a pooled regression is not appropriate because the heterogeneity in the parameter estimates is not effectively dealt with (Chang and Lee, 1977). From a theoretical perspective, Hsiao (1986) demonstrates that “ignoring such parameter heterogeneity among cross-sectional or time-series units could lead to inconsistent or meaningless estimates of interesting parameters”. To resolve this problem, it is therefore appropriate to use Generalize Least Squares (GLS) panel data models. The GLS panel estimation method includes fixed effect and random effect methods. To choose between the fixed and random effect model estimations, the Hausman test is employed to test assumptions about the relationship between the error term and the covariates. From the Hausman test (for model 1) provided evidence (chisq (5)=12.32, p-value= 0.0307) in favor of the fixed effect model while model 2 provided evidence of random effect (chisq (7) = 10.72, p-value = 0.1513). We further test for autocorrelation using Wooldridge test for autocorrelation. Evidence from the autocorrelation suggests that model 1 is autocorrelated (F (1, 19) = 5.370, p-value =0.0318) while model 2 was not autocorrelated (F (1, 15) = 0.639, p-value = 0.4364). Since heteroskedasticity and autocorrelation existed in both models, we employed robust standard errors of fixed and random effect to correct for the biases. Normality of variables and residuals were tested using Shapiro-Wilk normality test. The variables and the residuals were all normality distributed. We also derived a summary statistics of the variable to screen for outliers. Table 4.1 also presents the correlation between the variables employed in this study. It is used to check for multicollinearity which may cause variables not to be significant but the overall fitness of the model will be significant. However, we find leverage ratio (LR) and asset turnover (ATO) to be highly correlated but we still include both variables in the model. This is done because the variance inflation factor (VIF) which also shows the acceptability of each variable (when vif is below 10) in the model suggested that both variables can be use in the model.
Table 2: Pearson Correlation Matrix

|       | RoE    | OPM    | ATO    | LR     | IB     | TAXE–I   |
|-------|--------|--------|--------|--------|--------|----------|
| RoE   | 1.0000 |        |        |        |        |          |
| OPM   | 0.5397*** | 1.0000 |        |        |        |          |
| ATO   | -0.6334*** | -0.1050 | 1.0000 |        |        |          |
| LR    | 0.7844*** | 0.0836 | -0.9250*** | 1.0000 |       |          |
| IB    | -0.0562 | -0.4701*** | -0.0506 | 0.0053 | 1.0000 |          |
| TAXE–I| 0.0328 | -0.0871 | 0.0641 | -0.0432 | 0.1380 | 1.0000   |

Source: Computation on Data from BoG  Significance Level: 10% (*), 5% (**) and 1% (***)

Results and Discussion

From our empirical, we find operating profit margin (OPM) is positively and significantly related to return on equity (ROE) in model 1 and 2 at 1%. This indicates that as banks increase their income from their operations, they increase return to share or equity holders. This finding is consistent with Sundararajan, et al (2002) who all suggests that gross profit margin, return on assets and equity are perfect substitutes implying a positive correlation relationship among these variables. This means that banks can increase their profitability through operating profit margin.

Table 5: Regression Results

|       | RoE 1 | RoE 2 |
|-------|-------|-------|
| OPM   | 1.054 | 1.168 |
|       | (10.33)*** | (9.47)*** |
| ATO   | 1.036 | 1.105 |
|       | (16.04)*** | (11.94)*** |
| LR    | 0.976 | 0.962 |
|       | (17.72)*** | (18.63)*** |
| IB    | 0.976 | 1.151 |
|       | (10.13)*** | (7.19)*** |
| TAXE–I| 0.072 | 0.099 |
|       | (0.46) | (1.20) |
| BD    | -0.102 |        |
|       | (0.89) |        |
| BB    | -0.048 |        |
|       | (1.08) |        |
| _cons| -0.152 | 0.282 |
|       | (1.24) | (0.82) |
| $R^2$| 0.94 | 0.93 |
| N    | 124 | 84 |

Source: Computation on Data from BoG  Significance Level: 10% (*), 5% (**) and 1% (***)

We again report that asset turnover (ATO) is positive and significant (at 1%) determinant of bank profitability (that five step du-pont model) in model 1 and 2. This implies that 1 unit increase in ATO will lead to 1.036 units increase in bank ROE. As ATO measures how well a bank has utilize its resources (hence efficiency), the finding is consistent with Philip et al., (2007) and Little et al. (2009). We explain this find to mean that in Ghana are able to generate more sales from the resources (total assets) at their disposal, hence reducing per unit cost of the assets to increase bank profitability.
Bank leverage measured as total assets divided by total equity is found to have a positive and significant impact on bank profitability (ROE) at 1% in both model 1 and 2. We find that 1 unit increase in bank profitability (ROE) leads to 0.97 unit increase in bank profitability. We explain this result to mean that as bank management employ more debts, cost and risk of equity goes up (consistent with MM proposition I & II). This pressures management to performance or work extra hard to meet the return requirements demanded by equity holders. This is consistent with Modigliani and Miller Propositions I & II.

We also find that interest burden had a positive and significant relationship with bank profitability. This indicates that an increase in interest burden (reward for banks employing leverage) increases bank profitability also increases. We argue that bank use a lot of leverage through deposits mobilization but pays less interest on the deposits they employ and charge higher rates on loans, hence increasing bank profitability. This finding is consistent and explained by Athanasoglou et al. (2008) who found that interest rate spread was high which is an indication that banks pay lower interest on bank deposits but charge higher interest rates on loans. This leads to improved bank profitability.

**Conclusion**

The five step du-pont ratio analysis that shows the well-being of a firm at a glance for further investigation to be conducted. We find that five step du-pont model which is improvement on the three step du-pont model is not used in empirical studies to the best our knowledge, hence we employ it to investigate bank profitability in Ghana from 2006-2012. We further investigate the increase in bank deposits and branch networking on bank profitability. We find that bank deposits and branch networking were not significant determinants of bank profitability in the du-pont model. However, we found that operating profit margin, asset turnover, bank leverage and interest burden were positively and significantly related to bank profitability (ROE) in a five step du-pont model. That is, bank operational activities, bank efficiency, leverage usage and cost of leverage were found to determine bank profitability in a du-pont set-up. We further found that the total variation in bank profitability was explained by these variables by 94%. This means that the five step du-pont model better explains the total variation in bank profitability measured as ROE. For instance, Nissim & Penman (2001) suggests that with the inclusion of interest burden and tax effect the modified du-pont (five step dopnt) is able to capture variables outside the control of managers. Hence, the five step du-pont model is as better as employing firm or bank specific, industry and macroeconomic variables as in the studies of Althanasoglou et al. (2008), Goddard et al. (2004) and Dietrich and Wanzenried (2011). This suggests that bank specific variables are core in explaining the variations in bank profitability (ROE). This finding implies that, in a five step du-pont model, banks can increase the ROE by increasing the operating income generation abilities, improving asset utilization (efficiency) and employing more debts with lower interest payments. For future research direction, researchers can employ the five step du-pont model in other industries to see if it can explain the total variation in ROE as it has in the banking industry of Ghana.

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Appendix

Appendix 1
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
\[ F(1, 19) = 5.370 \]
\[ \text{Prob} > F = 0.0318 \]

Appendix 2
Modified Wald test for groupwise heteroskedasticity in fixed effect regression model
H0: \( \sigma^2 = \sigma^2 \) for all i
\[ \text{chi2 (24)} = 7.9e+05 \]
\[ \text{Prob>chi2 = 0.0000} \]

Appendix 3
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
\[ F(1, 15) = 0.639 \]
\[ \text{Prob} > F = 0.4364 \]

Appendix 4
Modified Wald test for groupwise heteroskedasticity in fixed effect regression model
H0: \( \sigma^2 = \sigma^2 \) for all i
\[ \text{chi2 (23)} = 15175.36 \]
\[ \text{Prob>chi2 = 0.0000} \]
### Appendix 5: Variance Inflation Factor

| Variable | VIF | 1/VIF  |
|----------|-----|--------|
| ATO      | 7.58 | 0.131864 |
| LR       | 7.48 | 0.133757 |
| IB       | 1.36 | 0.735603 |
| OPM      | 1.34 | 0.746634 |
| TAXEFFI  | 1.04 | 0.964434 |
| Mean VIF | 3.76 |         |

### Appendix 6: Normality of Variables

| Variable | Obs | W  | V  | z    | Prob>z |
|----------|-----|----|----|------|--------|
| RoE      | 141 | 0.9601 | 4.3990 | 3.3470 | 0.0004*** |
| lnOPM    | 137 | 0.8940 | 11.4200 | 5.4950 | 0.0000*** |
| ATO      | 159 | 0.8969 | 12.6070 | 5.7630 | 0.0000*** |
| LR       | 159 | 0.8513 | 18.1860 | 6.5960 | 0.0000*** |
| AXEFFI   | 141 | 0.7323 | 29.5390 | 7.6510 | 0.0000*** |
| IB       | 156 | 0.5800 | 50.5370 | 8.9110 | 0.0000*** |
| DEPOS    | 154 | 0.8699 | 15.4860 | 6.2200 | 0.0000*** |
| branch   | 111 | 0.9760 | 2.1660 | 1.7250 | 0.0423*** |

### Appendix 7: Normality of Residuals

| Residuals | Obs | W  | V  | z    | Prob>z |
|-----------|-----|----|----|------|--------|
| Model 2   | 84  | 0.9340 | 4.7190 | 3.4090 | 0.0003*** |
| Model 1   | 124 | 0.8768 | 12.1900 | 5.6120 | 0.0000*** |

### Appendix 8: Summary Statistics of Variables

| Variable | Obs | Mean | Std. Dev. | Min  | Max  |
|----------|-----|------|-----------|------|------|
| ROE      | 158 | 0.0869 | 0.1425 | -0.5719 | 0.5794 |
| OPM      | 155 | 0.2496 | 0.2945 | -0.6493 | 0.9985 |
| ATO      | 130 | 0.3040 | 0.3043 | 0.0319 | 0.9897 |
| IB       | 156 | 0.8717 | 1.3509 | -15.5798 | 1.8035 |
| LR       | 158 | 4.6166 | 5.7367 | 0.0395 | 37.5162 |
| TAXEFFI  | 142 | 0.7474 | 0.1905 | -0.5842 | 1.3552 |