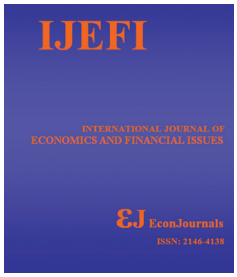

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Efficiency of Listed Banks Operations and Stock Price Movements

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ABSTRACT

Banks' efficiency is linked to stock performance. Literature from Ghana on the subject is that most banks are inefficient. What is not clear is whether this inefficiency translates into affecting stock price movements. Therefore, the study examines the effect of efficiency of listed banks operations on stock price movements in Ghana utilizing annual data from 2013-2017 for five banks. The banks' input and output variables were used to estimate the efficiency scores, within the Data Envelopment techniques. The results reveal that, the input and output variables accounted for about 80.5% of the banks' profitability and 92.5% of the banks' cost. The results indicated that, changes in profit efficiency have a significant positive impact on stock returns. However, a significant but negative effect of cost efficiency on stock returns was found. Thus, policy makers should encourage banks to operate efficiently in order to make effective capital allocation decisions.

Keywords: Banks Efficiency, Stock Price Movements, Data Envelopment Analysis
JEL Classifications: C23, G14, G21, G32

1. INTRODUCTION

The ultimate financial goal for every company is creating an added value and this can be achieved by having good management of resources and internal process. The more efficient the process, the higher value of added goods or services produced (Heizer and Render, 2009). Efficiency, which is one of firm's performance indicators, is a subject that has attracted a lot of interest from many researchers, shareholders and investors (Liargovas and Skandalis, 2008). It is found to be the foundation which guides the banking industry into a safe and healthy condition (DeYoung et al., 2001).

Efficiency is found by many researchers to have positive impact on stock performance. Liadaki and Gaganis (2010) found that, efficient bank's performance is reflected in their stock prices which are reflective in their continuous rise in their stock prices. In a similar study, Ioannidis et al. (2008) provided evidence from a sample across developing and developed Asian and Latin American countries. They also found a positive and robust relationship between profit on one hand and cost efficiency changes and stock performance on the other.

Despite reports of huge profits accruing to Ghanaian banks over the years, there is a general perception that the sector is inefficient in terms of service provision and cost management (Bawumia et al., 2005; Sarpong et al., 2017). The efficiency of the banking industry is imperative to monetary policy implementation and economic stability. The efficiency of a banking industry is measured by the average efficiency of the individual banks in the industry. The efficiency of the individual banks in the country reflects the efficiency of the whole banking industry. An efficient financial system must be capable of measuring, analyzing and hedging or otherwise limit all types of risk faced resulting from transactions undertaken.

With the growing competition in the banking industry and the inherent micro-economic challenges in Ghana, the industry

continue to experience significant increase in cost with regard to staff cost, development of new products to meet their customer needs and technology. For instance, the industry's average cost grew by 52% from GHS22 billion in 2013 to GHS34 billion in 2014 whilst the industry's profit before tax margin declined from 45.3% in 2013 to 43.2% in 2014 (PWC, 2015). With this statistics, one will wonder if the banks in Ghana are efficient enough to compete in the current global banking market or are still inefficient as was found by Bawumia et al. (2005). Also, over the past few decades, determining the effects of the efficiency of bank's operation on stock prices has preoccupied the minds of economists. In the literature, there are many empirical studies that disclose the relationship between efficiency and stock prices. For instance, Aftab et al. (2011) did research on the banks listed on the Karachi Stock Exchange and found that the efficiency of the banks influence share performance.

Despite a very large amount of literature on banking efficiency, the literature is still at the forming stages when it comes to studies that focus on investigating the relationship between bank efficiency and stock performance, especially in the emerging markets, like Ghana. Therefore, this study evaluates the impact of banks efficiency on stock price movements in Ghana. The rest of the study is organized as follows: Section two offers the theoretical and empirical literature on the study. Section three presents the methodology adopted for the study. Section four analyses the data and discuses the results. The final section, section five concludes the study.

2. LITERATURE REVIEW

Theoretically, three major concepts underpin the performance and efficiency of firms in general of which life insurance is part. These include the structure conduct performance (SCP) Model, the efficient structures hypothesis (ESH) and capital asset pricing model (CAPM). The SCP model is one of the earliest frameworks used to examine the factors that determine the profitability of firms (Grygorenko, 2009). According to Baye (2010), the structure of an industry refers to factors such as technology, concentration and market conditions. Conduct defines how individual firms behave in the market; it involves pricing decisions (such as interest rate, commission and fees), advertising decisions, and decisions to invest in research and development, among other factors. In this case, performance can be viewed in terms of profits and social welfare that arise in the market. The SCP paradigm views these three aspects of the industry as being integrally related and has the assertion that, the market structure causes firms to behave in a certain way. In turn, this behaviour causes resources to be allocated in certain ways leading to either an efficient or inefficient outcomes. The only failure found in this model is that it does not recognize that performance can impact on structure and conduct, while structure can impact on both performance and conducts (Sathye, 2005; Samad, 2008).

In terms of the ESH, Demsetz (1973) was the first to attempt to theoretically offer an alternative explanation on the relationship, by proposing the ESH. He did this by stating that higher profits of firms are not as a result of their collusive behaviour but because of high efficiency level, which in turn, leads to larger markets shares that firms possess. In other words, profitability of firms is determined not by the market concentration but by firm efficiency (Grygorenko, 2009). This hypothesis stipulates that a firm which operates more efficiently than its competitors gains higher profits resulting from low operational costs, and also holds an important share of the market. Consequently, an unequal distribution of positions within the market and an intense concentration are created by differences at the level of efficiency (Mensi and Zouari, 2010). An empirical examination of the ESH was performed by Smirlock (2005) where he considered market share as a proxy to efficiency.

The CAPM describes the relationship between risk and expected (required) return. This model shows the expected return on a firm's stock as a function of risk-free rate and a premium based on the systematic risk. The greater the systematic risk, the greater the return the investors will expect from the security. The relevance of this model to this study lies in the underlying logic behind the model and is based on the fact that CAPM views the total portfolio risk as a function of systematic risk and unsystematic risk. The systematic risk is attributed to factors that affect the market as a whole such as government policies, changes in the economy and the political climate. The unsystematic risk is specific to a particular company such as industrial relations, quality of firm's management or a new competitor in the industry. Systematic risks cannot be avoided through diversification. However, unsystematic risk can be avoided through diversification. The CAPM can be applied to firms even though it describes stock and portfolio risks. It asserts that in market equilibrium, a security is expected to provide return commensurate with its systematic risk. Investors should therefore not be compensated for unsystematic risks since it assumes investors are rational and risk-averse enough to diversify unsystematic risks.

The CAPM has been challenged by the fact that it takes a very simplistic view of the relationship between risk and return neglecting the effects of market imperfections. Thus, it does not reflect the reality in the market. The asset pricing theory extends the idea of the CAPM. This theory asserts that in a competitive market, arbitrage will ensure equilibrium pricing according to risk and return. The expected return of the security is the risk-free rate plus risk premiums for risk factors which are uncertain (Horne and Wachowicz, 2008). The idea is the same as that of the CAPM with the exception that we now have multiple risk factors.

The methodological and empirical literature focus on firm's efficiency measurements and the corresponding results associated with it. Firm's efficiency can be measured by two main methods, either by using the parametric method or the non-parametric method (Eltivia et al., 2014). The parametric method employs statistical methods to estimates the efficiency whilst the non-parametric method uses linear programming to calculate linear segments related to the frontier. Most commonly used efficiency measures are stochastic frontier approach (SFA) and data envelopment analysis (DEA). The prior is parametric while the latter is non-parametric in nature. SFA is sometimes referred to as econometric approach while DEA is referred to as programming approach. Both approaches have their own merits and demerits.

DEA is a technique used to evaluate the relative efficiency of decision-making units (DMU). DEA uses linear program as the base of measurement (Fiorentino et al., 2006), that allows comparison between the efficiency of a combination of several units of input (Cooper et al., 2000), and several units of output (Casu and Molyneux, 2003). It was introduced into the financial sector through behaviour model for financial institutions which was used to comprehend the production possibilities (Avkiran, 2006). There are many researches on firm efficiency that used DEA. However, different variables were used by each study for inputs and outputs (Akhtar, 2010). For instance, Akhtar (2010) used DEA to compare efficiency of 40 Pakistani banks by using deposits and capital as inputs and investment portfolio, loans and advances as outputs. Debasish (2006) also measured the relative performance of Indian banks for the period 1998 to 2004 using DEA model. He observed that, foreign banks were more efficient than domestic banks.

The SFA on the other hand was independently developed by Aigner et al. (1977), and Meeusen and van den Broeck (1977) as a parametric frontier method. The SFA uses a composed error model in which inefficiency is assumed to have asymmetric (one-sided) distribution and the random error has symmetric (two-sided) distribution. The SFA modifies a standard cost (production) function to allow inefficiencies to be included in the error term. The predicted standard cost function is assumed to characterize the frontier while any inefficiency is captured in the error term, which is constructed orthogonal to the predicted frontier. This assumption forces any measured inefficiencies to be uncorrelated with the regressors and any scale or product mix economies derived linearly from these explanatory variables (Ferrier and Lovell, 1990).

Okuda et al. (2003) used SFA to estimate the cost function of the Malaysian commercial banks from 1991-1997 and its impact on bank restructuring. The study, which observed economies of scale but not economies of scope, indicated that Malaysian domestic banks were making unproductive capital investments. Also, Liadaki and Gaganis (2010) employed the SFA to measure bank cost and profit efficiencies of 171 listed banks operating in 15 EU countries over the period 2002-2006. The results revealed that, profit efficiency changes had a positive and significant effect on stock prices, while changes in bank cost efficiency show no significant impact on stock returns.

On the measurements of stock price movements, it is clear that the price of an asset reflects the value of both future payouts earned by holding that asset and possible increases in the price of that asset. The importance of the future price of an asset for its current price introduces a dynamic element into asset pricing equations. The behavior of stock returns has been extensively debated over the years. Researchers have examined the efficient market and random walk characterization of returns and alternatives to random walk. The validation of random walk implies that market is informational efficient. In an efficient market, current prices fully reflect available information and hence there is no scope for any investor to make abnormal profits (Fama, 1970). According to Dwi-Martani and Khairurizka (2009), research in finance shows that firm's characteristics (such as growth, company size, efficiency) can predict the future stock price. Johnson and Soenen (2003) analyzed 478 firms in USA during 1982-1998 and concluded that big sized and profitable firms with high level advertising expenditure have better performance in terms of those three measurements.

Survey evidence reveals that, one of the most important considerations for equity issuance is the extent to which managers view the share price of their companies, either overvalued or undervalued at a given point of time (Graham and Harvey, 2001). This suggests that managers take advantage of a "window of opportunity" to time their equity. The fact that equity issuances are preceded by increases in stock prices is consistent with market timing behavior.

Graham and Harvey (2001) stated that, timing behavior requires two essential ingredients. First, the information sets of managers and financial markets concerning the value of the firm, that is, managers must think they can recognize when stock prices have diverged from fundamental value. Second, the market must under react to equity issuance announcements. If these conditions hold and managers are indeed correct on average, timing behavior can create value for a firm's long-term shareholders. Since information asymmetry is an integral element of market timing behavior, one would expect that firms that are more susceptible to information asymmetry would also be the ones that are more inclined to timing the market.

Baker and Wurgler (2000) examined aggregate data and found that the period in which aggregate equity issuance (relative to total debt and equity issuance) is high is followed by a period of low stock market returns. Furthermore, researchers postulated that at any given moment, equity's price is strictly a result of supply and demand. Thus, price of shares is determined when there is equilibrium for the supply and demand of shares. The supply is the number of shares offered for sale at any one moment. The demand is the number of shares investors wish to buy at exactly that same time. The price of the stock moves in order to achieve and maintain equilibrium.

The value of a share of a company at any given moment is determined by all investors voting with their money. If more investors want stock and are willing to pay more, the price will go up. If more investors are selling stock and there are not enough buyers, the price will go down. Simpson and Richards (2009) also buttressed this by stating that stock prices fluctuate because at any given time, some people might be selling large quantities of stock (driving demand and prices down) while others might be buying stock (driving demand and prices up).

Many researchers have found that efficiency has an impact on stock performance. Liadaki and Gaganis (2010) employed the SFA to measure bank cost and profit efficiencies of 171 listed banks operating in 15 EU countries over the period 2002-2006. The results revealed that, profit efficiency changes had a positive and significant effect on stock prices, while changes in bank cost efficiency show no significant impact on stock returns. The authors attribute these results to the idea that shareholders and investors are more interested in earnings that give positive expectations

regarding bank future dividend than costs. Aftab et al. (2011) also found similar results when they did research of the Banks listed on the Karachi Stock Exchange, and found that the efficiency of the banks influence shares performance.

Kirkwood and Nahm (2006) used DEA to evaluate cost efficiency of Australian banks in producing banking services and profit between 1995 and 2002. The empirical findings indicated that the major banks have improved their efficiency in producing banking services and profit, while the regional banks have experienced little change in the efficiency of producing banking services, and a decline in the efficiency of producing profit. They further related the changes in efficiency to stock returns and found that change in bank efficiency is reflected in stock returns.

On similar grounds, Sufian and Majid (2006) empirically investigated the cost and profit efficiencies of Malaysian banks that are listed on the Kuala Lumpur Stock Exchange during 2002-2003 by applying the non-parametric DEA model. They found that the cost efficiency of Malaysian banks was on average significantly higher compared to profit efficiency. They also suggested that the large banking groups on average were more cost efficient, whereas the smaller banking groups were found to be more profit efficient. They suggested that the stock prices of Malaysian banks react more towards the improvements in profit efficiency rather than the improvements in cost efficiency.

3. METHODOLOGY

3.1. Study Design

This study employed quantitative research design by using secondary data from the Ghana Stock Exchange. Also, among the different types of estimation methodologies, the efficiency scores in this study were estimated by using DEA, one of the most widely applied parametric technique. The data for the selected firms was collected from their respective annual financial reports. The calculation of the input and output variables of the banks were made from the financial statements.

To calculate the efficiency score for both profit and cost, the study used efficiency measurement system (EMS) software which computes DEA efficiency measures. The study used the input and output variables given in Table 1.

EMS was run to obtain the various efficiency score per each DMU, which in this case were the financial years of the respective banks.

Also, even though the data on stock returns were given on daily basis, the cumulative annual stock returns (CASRs) (as specified in equation 5 were calculated). The analysis were done using regression statistical techniques.

3.2. Measurement of Efficiency

Two main types of efficiency concepts are commonly used to measure efficiency level: profit efficiency and cost efficiency. This study employed both methods to measure the firm's efficiency. The cost efficiency measures how well the banks perform relative to a "best–practice" producing the same output bundle under the same environmental conditions (Berger et al., 1996). In other words, cost efficiency measures how close the firms minimize cost, where the minimum cost is determined by best performers in the dataset.

The costs (C) of a firm depends on the output vector (o), the price of inputs (i), the level of cost inefficiency (u) and a set of random factors (v) which incorporate the effect of errors in the measurement of variables, bad luck, etc. Thus, the cost function is expressed as:

$$C = C\,(o,\ i,\ u,\ v) \tag{1}$$

On the other hand, profit efficiency takes into account the effects of certain factors of production on both costs and revenues. Usually, two main profits can be assumed depending on the level of market power: the standard profit function and the alternative profit function.

The standard profit function assumes that markets for outputs and inputs are perfectly competitive. Given the input and output price vectors, (p) and (w) respectively, the banks maximize profits by adjusting the amounts of inputs and outputs. Thus, the profit function can be expressed as:

$$P = P\,(w,\ p,\ v,\ u) \tag{2}$$

3.3. Input and Output Variables (Control Variables)

To specify the input prices and outputs to be used in cost and profit functions, two main approaches have been suggested in the literature; namely, the "production approach" and the "intermediation approach". Under the production approach, banks are considered as mainly producing services for account holders (Berger et al., 1996), and therefore, physical inputs, such as labor and capital are used to produce bank outputs, such as deposits, loans and other bank liabilities. On the other hand, under the intermediation approach, proposed by Sealey and Lindley (1977),

Table 1: Input and output variable

Variable	Symbol	Name	Description
Dependent variable	TC	Total costs	Total interest and non-interest expenses
	P	Profit	Pre-tax profit
Input prices	w_1	Price of labor	Personnel expenses/total assets
	w_2	Price of physical capital	Non-interest expenses less personnel expenses/fixed assets
	w_3	Price of borrowed funds	Total interest expenses/total funding
Outputs	y_1	Total loans	Sum of short and long terms loans
	y_2	Other earnings	Total earnings assets less total loans
	y_3	Securities	Sum of securities
Other variable		Size	Logarithm of total asset

Source: Authors' development

banks are thought of as financial intermediaries that channel funds between savers and investors, and hence deposits, other borrowed funds, capital and labor are considered as inputs transferred in the production process into outputs, such as loans and other earning assets. While Berger et al. (1996) pointed out that the production approach is somewhat better for evaluating the efficiency of branches of financial institutions, they argued that the intermediation approach might be more appropriate for evaluating the efficiencies of entire financial institutions.

Following modern empirical literature on bank efficiency; such as Hollo and Nagy (2006), Mamatzakis et al. (2008) and Altunbas et al. (2001), this study employed the intermediation approach. Table 1 summarizes the total cost and profit functions and the main input and output variables along with their description.

3.4. Bank Efficiency and Stock Performance

Bank stock performance was represented by annual stock returns, which were calculated for each bank by adding daily returns. This measure was believed to be a better measure than calculating a point increase with data from the first and the last day of the period under investigation. Daily returns have smaller standard deviations than do annual and monthly returns. To reduce the overreaction problem, changes in the weekly moving averages of stock returns were also calculated. Data smoothing mitigates the excessive reactions of investors. To examine the relationship between efficiency and stock performance, bank stock returns were regressed against efficiency estimates. The estimated model is:

$$R_{jt} = \beta_0 + \beta_1 E_{jt} + \varepsilon_{jt} \quad (3)$$

Where

R_{jt} = return on bank j's stock for the annual period ending at time t;
E_{jt} = bank j's annual percentage change in efficiency.

Bank stock performance was represented by CASR, calculated on the basis of monthly returns using the following equation:

CASR in year t = (1 + month 1 return)* (1 + month 2 return)*. *(1+ month 12 return) − 1 (4)

Instead of efficiency score in year t, efficiency change was preferred because the change between year t and year $t-1$ is perceived as a specific publicly available information by the investors who aim to make investments on bank stocks. More importantly, it does not make sense to use the efficiency score at time t to analyze its impact on the bank stock performance at time t, due to the inability of investors to access information concurrently (Vardar, 2013). The efficiency change is measured as percentage change in efficiency scores at year-end over the period of our analysis. The efficiency change in year t can be represented as follows:

$$\text{Efficiency change in year } t = \frac{\text{Efficiency Score}_t - \text{Efficiency Score}_{t-1}}{\text{Efficiency Score}_{t-1}} \quad (5)$$

3.5. The Data Analysis Model

To critically examine the impact of the firms' efficiency on the financial performance, panel data methodology was employed. Panel data according to Ehikioya (2009) is a dataset in which the behavior of entities is observed across time. Panel data allows one to control variables which cannot be observed or measure like cultural factors or difference in business practices across companies; or variables that change over time but not across entities. That is, it accounts for individual heterogeneity. One advantage of panel data is that, researchers are able to get large number of data points which normally increase the degree of freedom and reduce collinearity among explanatory variables. However, with panel data, data cannot be observed independently across time and analyzing such pooled data is difficult when compared with running a cross-sectional analysis.

The basic panel model is written as follows:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad (6)$$

Where

a) i denotes the cross-sectional dimension and t represents the time-series dimension,
b) Y_{it}, represents the dependent variable, which is the firm's profitability ratio–return on assets
c) X_{it} contains the set of explanatory variables. These are the inputs and outputs variables
d) α is the intercept and β represents the coefficients.

To run regression for panel data, either the fixed effect or random effect model can be used. To determine which effect model is applicable for the available data, Hausman test is run based on the hypothesis below:

H_0: The preferred model is random effects
H_1: The preferred model is fixed effects

Both the fixed and random effects models were estimated as well as the Hausman test was performed. It was found that, the probability value (p) was less than the significant level (0.05), hence the null hypothesis (random effect) was rejected and the fixed effect model was then used to run the regression.

4. ANALYSIS AND DISCUSSION

4.1. Descriptive Analysis of the Variables

Table 2 displays summary statistics for the dependent variables, input prices, outputs that are used in the cost and profit efficiency functions. As can be seen from the table, the mean prices of labor, physical capital, and borrowed funds for the sampled listed banks are (3.84%), (79.95%) and (31.29%), respectively. Similarly, the banks' total average loans for the period was GH¢816,984 and they were invested into securities which amounted to GH¢459,469. Also, within the period, the average total other earnings from the banks' asset was GH¢1,363,440. These input and output variables resulted in an average profit of GH¢97,692 and an average total cost of GH¢206,031.

4.2. Impact of Input-Output Variables on Total Cost and Profitability of the Banks

According to Heizer and Render (2009), increasing productivity means improving the efficiency of the company, while the concept

Table 2: Descriptive statistics of bank level variables

Measures	Dependent variable		Input variables			Output variables		
	Total cost	Pre-tax profit	Price of labour	Price of physical capital	Price of borrowed funds	Total loans	Other earnings	Securities
Mean	206,031	97,692	0.0384	0.7995	0.3129	816,984	1,363,440	459,462
Standard error	27,706	18,056	0.0026	0.0819	0.0404	132,347	743,862	96,025
Median	153,316	83,714	0.0358	0.8562	0.2408	747,385	522,298	276,618
Minimum	50,059	6,725	0.0208	0.0800	0.0222	161,854	63,805	10,152
Maximum	544,166	317,059	0.0780	1.6277	0.8564	3,070,653	19,057,244	1,712,204
Count	25	25	25	25	25	25	25	25

Source: Authors' calculation

of efficiency is a comparison between inputs and outputs. Input is the resources used to produce the output, while the output is the results after all. For a bank to be very efficient, it has to have a very accurate mix of input and output variables to reduce cost and increase profitability. In view of this, the study estimates the impact of the input and output variables considered to have effect on the total cost and the profit of the banks. The regression output of the input/output variables and profit is presented in Table 3. Table 3 shows that, the coefficient of determination (Adj. R^2) is 0.805 which means that the input and output variables of the banks account for about 80.5% of the banks' profitability. The F statistics (0.00) which is less than alpha level of 0.05 also reveals that, all the variables considered are significant determinants of the firm's profitability.

It can further be observed that, all the output variables have positive coefficient which means that, increase in these variables will result in higher profitability. However, for the three output variables, only total loans and securities were found to be significant whiles other earnings was not significant. Also, for the input variables, both price of physical capital and price of borrowed funds have negative impact on profitability whiles price of labor has positive impact. However, none of the input variable has significant impact on profitability of the banks as their P-values are all greater than the alpha level of 0.05 (except that the price of physical capital is significant at 10%). The positive impact of price of labor on profit conforms to the results of Hopp et al. (2007) who mentioned that, increasing the amount of labor allows employees to spend more time with customers leading to customer satisfaction which has positive correlation with profitability.

Similarly, the regression output of the total cost and the output/input variables is presented in Table 4. It reveals that, the input and output variables of the bank contribute to about 92.5% of the banks' total cost. All the considered input and output variables were found to have positive impact on the total costs of the banks. Price of labor was significantly found to have the greatest impact on the total cost as it recorded the highest coefficient (10.16) followed by price of borrowed funds which also significantly recorded coefficient value of 0.899.

In addition, price of physical capital (input) even though have a positive impact on cost, it is not a significant variable to determine the total cost. This was evident as its P-value (0.969) is greater than alpha level of 0.05. This results is similar to securities which is an output variable. It is also evident that, the process of issuing out loans as well as obtaining other earnings increase the cost as these two variables are also significant.

Table 3: Regression of profit and input/output variables

Regression statistics				
Multiple R	0.924			
R square	0.854			
Adjusted R-square	0.805			
Significance F	0.000			
Variables	**Coefficients**	**Standard error**	**t-Stat.**	**P-value**
Constant	−5.762	2.411	−2.390	0.028
Price of labour	7.354	9.682	0.760	0.457
Price of physical capital	−0.545	0.307	−1.774	0.093
Price of borrowed funds	−0.432	0.709	−0.609	0.550
Total loans	1.042	0.190	5.490	0.000
Other earnings	0.014	0.146	0.097	0.924
Securities	0.237	0.119	1.998	0.041

Source: Authors' calculation

Table 4: Regression of total cost and input/output variables

Regression statistics				
Multiple R	0.971			
R square	0.944			
Adjusted R square	0.925			
F-statistic	0.000			
Variables	**Coefficients**	**Standard error**	**t-Stat.**	**P-value**
Constant	−1.679	0.921	−1.824	0.085
Price of labour	10.157	3.698	2.747	0.013
Price of physical capital	0.005	0.117	0.040	0.969
Price of borrowed funds	0.899	0.271	3.318	0.004
Total loans	0.719	0.073	9.915	0.000
Other earnings	0.219	0.056	3.930	0.001
Securities	0.044	0.045	0.981	0.340

Source: Authors' calculation

4.3. Cost and Profit Efficiency Estimates

The estimates of cost efficiency scores, based on common frontier have been obtained from stochastic Trans log cost function which includes output levels and input prices. The measure of efficiency takes a maximum value of 1, which corresponds to the most efficient bank in the sample. The average estimated cost efficiency scores for the whole sample is 71.2%, or cost inefficiency level of 28.8%, suggesting that an average bank produces with a 0.712 of cost efficiency in the sample or an average bank in the sample could have saved about 28.8% of total cost if it had used the best practice

technology, thereby, matching its performance with the best performance banks. The average estimated cost efficiency scores assumed an increasing trend from 2013 to 2016. The minimum cost efficiency score was recorded in the year 2013 (65.2%) whiles the highest score was realized in the year 2016 (79.8%). Table 5 presents the various statistics for each year.

Estimates of alternative profit efficiency are presented in Table 6. The average profit efficiency score of all banks in the sample is 0.471, which indicates that during the period, the earnings of banks reached 47.1% of their potential profits on average. In other words, a profit inefficiency of 0.529 suggests that, an average bank could increase its profits by 52.9% if it was to meet the performance of the best-practice bank. It can also be realized that, the profit scores also followed the same trend as those of the cost estimates. That is, there was a steady increase in the profit efficiency score from 2013 to 2016 and it fell in 2017.

As seen in Tables 5 and 6, profit efficiency estimates are lower than cost efficiency estimates. This outcome is consistent with the results of earlier studies such as Maudos et al. (2002), Lozano-Vivas and Pasiouras (2008) and Mamatzakis et al. (2008). The above efficiency results can be justified from the fact that there was high demand for financial services and low financial intermediation penetration over the sample period, which left the banks in the country in a dominant position as a provider of these services. Therefore, since banks have specifically concentrated on increasing their investment activities, profit efficiencies stayed behind cost efficiencies (Mamatzakis et al., 2008).

Additionally, regarding the potential reward of expanding market shares in a rapidly growing market, banks do not have much incentive to maximize their profits by means of full utilization of their discretionary pricing power (Rossi et al., 2004). Furthermore, banks face less pressure to increase their profitability as interest margins in these banking systems are so high, thereby, making much more effort to restructure their activities to manage costs.

4.4. Impact of Cost and Profit Efficiency on Stock Returns

After estimating the cost and profit efficiency scores based on stochastic frontier method, the stock returns (CASR) were regressed against corresponding annual change in efficiency estimates while controlling for size [using natural log of total assets (TA)] to assess the relationship between stock returns and efficiency.

Table 7 shows the regression results for the change in profit efficiency and CASRs. Generally, if improvements in cost and profit efficiency are reflected in stock returns, a positive association is expected between these changes and stock returns. The results indicate that profit efficiency changes have a positive and statistically significant impact on stock returns. The positive impact of profit efficiency on stock return could be explained by the argument that, rational shareholders and potential investors are very concerned about the profits as they provide an indication about the future dividend payments and capital gains.

Table 5: Average cost efficiency scores

Year	Cost efficiency		
	Mean	Standard deviation	Coefficient of variation
2013	0.652	0.130	0.199
2014	0.668	0.169	0.252
2015	0.732	0.267	0.364
2016	0.798	0.281	0.352
2017	0.708	0.239	0.338
Overall	0.712	0.217	0.301

Source: Authors' calculation

Table 6: Average profit efficiency scores

Year	Profit efficiency		
	Mean	Standard deviation	Coefficient of variation
2013	0.192	0.197	1.026
2014	0.241	0.289	1.198
2015	0.264	0.316	1.197
2016	1.525	0.820	1.849
2017	0.132	0.062	0.472
Overall	0.471	0.337	1.148

Source: Authors' calculation

Table 7: Regression of stock returns and profit efficiency change

Variables	Coefficients	t-Stat.	P-value
Constant	4.018	1.588	0.126
Profit efficiency	0.191	1.701	0.021
Size	0.309	1.223	0.039
Multiple R	0.450		
R square	0.202		

Source: Authors' calculation

Table 8: Regression of stock returns and cost efficiency change

Variables	Coefficients	t-Stat.	P-value
Constant	3.040	1.172	0.254
Cost efficiency	−0.926	1.900	0.019
Size	0.280	1.728	0.014
Multiple R	0.376		
R Square	0.142		

Source: Authors' calculation

This finding is consistent with Liadaki and Gaganis (2010) who found that, profit efficiency changes had a positive and significant effect on stock prices, while changes in bank cost efficiency show no significant impact on stock returns. The authors attributed these results to the idea that shareholders and investors are more interested in earnings that give positive expectations regarding bank future dividend than costs. Aftab et al. (2011) also found similar results when they studied banks listed on the Karachi Stock Exchange, and found that the efficiency of the banks influence shares performance. Also, the profit efficiency naturally includes the revenue side of the profit function. If banks are more profitable, this will be directly reflected in the future expectations of the banks' stock returns.

In similar fashion, Table 8 presents the regression analysis of the cumulative annual returns and cost efficiency change. It was revealed that, cost efficiency changes have a negative and statistically significant impact on stock returns. This means that, cost efficiency scores, which offer an indication for the capability of managers, will not be reflected positively in the bank stock returns. This finding also suggests that, stocks of cost efficient banks do not tend to outperform their inefficient counterparts. Even though both better profit management and better cost management are directly observed by the public and reflected in the stock prices, rational shareholders or potential investors in transition countries do not perceive the cost efficiency changes positively.

Even though this findings agrees with that of Liadaki and Gaganis (2010) who found similar results, it deviates from Beccalli et al. (2006) who found that, changes in bank cost efficiency affect stock returns positively and significantly among European listed banks operating in five countries. The current findings also differs from the findings of Pasiouras et al. (2008) who found that there was a positive and significant relationship between stock performance and annual change in bank technical efficiency. Ioannidis et al. (2008) also found a positive and robust relationship between profit and cost efficiency changes and stock performance among sampled developing and developed Asian and Latin American countries.

In addition, the explanatory variables (size) which account for the impact of efficiency change on the stock returns, was found to be statistically significant at 5% for both cost and profit efficiency scores. Moreover, the explanatory power of the profit changes and cost changes in the variability of stock returns was approximately 20.2% and 14.2% respectively. These shows that, banks' efficiency explains little of their stocks performance. Generally, it can concluded, that banks efficiency impacts on stock performance.

5. CONCLUSION

Banks efficiency is linked to stock performance but the literature from Ghana on the subject is that most banks are inefficient making the topic compelling. What is not clear is whether this inefficiency translates into affecting stock price movements. Therefore, the study examined the efficiency of listed banks' operations on stock price movements in Ghana utilizing input and output data from 2013-2017.

From the findings, the positive impact of profit efficiency on stock return could be explained by the argument that rational shareholders and potential investors are very concerned about the profits as they provide an indication about the future dividend payments and capital gains. Cost efficiency scores, which offer an indication for the capability of managers, will not be reflected positively in the bank stock returns. This finding suggests that stocks of cost efficient banks do not tend to outperform their inefficient counterparts. Even though both better profit management and better cost management are directly observed by the public and reflected in the stock prices, rational shareholders or potential investors in Ghana do not perceive the cost efficiency changes positively.

It can also be concluded that, shareholders are interested in both profits and costs. Even though it is expected that cost efficient banks should be more profitable and generate greater returns for their shareholders, in this study, it was found that the cost efficient banks, despite being more profitable, they cannot provide higher shareholder returns. Also, it is likely that profit efficiency estimates are indicators of the "quality of earnings" and "persistency of earnings", whereas traditional profitability ratios are not (Ioannidis et al., 2008). Additionally, cost efficiency estimates are indicators of the "cost management," which provide more advantages over accounting ratios.

The results of this study have crucial implications. The investigation of the determinants of the bank efficiency and their relationship with the stock performances is vital in terms of understanding the intrinsic valuation of the banks' stocks generally. Evaluating the performance of banks and thus, assessing their efficiency in maximizing shareholder wealth have relevance for computing the cost of capital since more efficient banks are expected to raise capital at a lower cost. The impact of banking efficiency on the bank stock returns has important implications for regulators and policy makers since it is important for regulators, especially in developing countries, to create an environment which enhances the efficiency and stability in the banking systems. Moreover, this provides new insights for policy makers due to the importance of the efficiency in affecting the shareholder wealth maximization in banking. Overall, it can be concluded that, changes in bank cost and profit efficiencies are reflected in changes in stock prices, meaning that stocks of cost and profit efficient banks tend to outperform the stocks of their inefficient counterparts in the Ghanaian capital market.

It is recommended that, policy makers should not only evaluate banking policies through the financial stability but also should investigate the policies that encourage banks to operate efficiently in order to make effective capital allocation decisions. Also, efficient management of bank's operations can help alleviate the high operational cost that erodes banks profits. Bank's occupancy cost and salaries are major components of operational cost. Banks must be encouraged to employ more technologies to automate their service delivery. The use of ATMs and electronic based bank services would reduce the number of branches that would be required. Moreover, these technologies would enable banks to explore new markets without maintaining a physical presence. It would reduce the number of staff costs, occupancy cost, paper cost and queuing times in the banking halls. Bank branches should only be built at strategic locations. Managerial cost and other expenses should be at optimal level and consistent with profit maximization objectives of shareholders.

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