Effects of Foreign Bank Entry on Technical Efficiency of a Bank Sector – The Case of Ghana

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DECLARATION

I, Abraham Nii Adoteye Saka, hereby declare that this thesis consists of my own work and has neither in whole nor in part been presented to this university or any other university for the award of any degree. In places where references to other people’s work have been made, cited or their views adopted, fully acknowledgements have been given. I hereby accept full responsibility for any lapses that may result from this work.

..................................................

ABRAHAM NII ADOTYE SAKA
(STUDENT)
DEDICATION

I dedicate this work to future family, my parents, my siblings and to all those who supported and encouraged me throughout the period of my studies.
ACKNOWLEDGMENTS

Firstly, I give Glory to God for how far He Has brought me. Indeed, without Him I can do nothing. My gratitude also goes to my supervisors, Eva Wittbom and , for painstakingly supervising my work. Her comments and guidance at every stage of the work were very insightful and very useful. I wish to thank all the faculty members of the School of Management at Blekinge Institute of Technology for their support and contribution as well.

I also thank all who have helped to make this thesis what it is now.
ABSTRACT
The purpose of this research is to analyze the effects of the entry of foreign banks on the technical efficiency performance of the domestic banking sector over the period 2000 - 2008. This study uses a sample of 23 banks (3 state banks, 9 private domestic banks and 11 foreign banks) and a two-stage approach for the data analysis.

The researcher first uses the Data Envelopment Analysis (DEA) approach to estimate technical efficiency scores of all 23 banks used in research. The results indicate that banking technical efficiency performance of the banking industry has been fluctuating over the study period.

To investigate the effect the entry of foreign on the domestic bank, we run a Tobit regression. The regression focuses on the determinants of technical efficiency of the domestic banks, using variables like return on assets, liquidity ratio, inflation, etc. In this same regression, a proxy labelled as foreign share is added as one of the independent variables in order to help us test how the entry of the foreign banks has affected the domestic banks.

The study suggests that factors which affect the technical efficiency of domestic banks in Ghana include return on assets, liquidity ratio, bank capitalization, and concentration/competition.

The findings further suggest that the domestic banks have been positively affected by the entry of the foreign banks. The implication of this is that the domestic banks are probably cashing in on the benefits such new technologies and know-how, new processes and practices, etc. foreign banks provide when they enter any economy. Hence, the policy implication is for Bank of Ghana to continue to encourage profitable foreign banks to come into Ghana. The ultimate beneficiary would be the final consumer because they stand to benefit from improved services and service delivery, competitive/low prices.
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CHAPTER ONE
BACKGROUND TO THE STUDY

1.1 Introduction

What are the drivers of efficiency and productivity in banks and the banking sector as whole? What are the effects that the entry of foreign banks poses on the efficiency and productivity performance of domestic banks and the local banking industry? These are questions that are often asked by financial industry regulators as well as practitioners because the banking sector, a part of the larger financial systems, has an important role to play in the economic development process of any country. Financial institutions are the main intermediation channels between surplus units of funds and deficit units of funds in any economy. In Ghana, like many other economies, the financial systems tend to evolve around the banking system. As the main financial intermediary, banks ensure mobilization of savings from diverse sources and allocate the savings to more productive activities; benefiting not only investors and beneficiaries of the investments but the whole economy (Gulde et al, 2006).

An efficient banking system enables lower transaction costs and helps bring together both the supplier and borrowers of funds to transact business at minimal or no cost. Indeed, a banking system which efficiently channels financial resources to productive use is a powerful mechanism for economic growth (Levine, 1997). Therefore, in order to ensure the continuous improvements in the efficiency performance and higher productivity of the banks and the banking sector, there is the need for financial sector reforms within the banking industry. In line with this Ghana has tried and implemented several policies/measures over the last five decades. In fact, since the 1980s especially, major financial sector reform programmes have been implemented in Ghana. Notable examples include: The Economic Recovery Programme (ERP) in April 1983, with the aim of liberalizing the economy from controls in order to enhance productivity in the economy, The Financial Sector Adjustment Programme (FINSAP) in 1988, which was aimed at addressing the weaknesses in the banking industry, Restructuring the public sector banks
Despite the fact all the above reforms are all important of particular interest to this study is the opening up of the banking to sector to foreign banks. This is because opening one’s banking sector to foreign banks to compete with domestic banks offers several advantages as well as disadvantages. Several studies including those of Terrel (1986) and Bhattacharaya (1997) have postulated that the entry of foreign banks into any economy increases competition, which creates a competitive banking system and cause the individual banks to strive to be efficient in their operations. Isik and Hassan (2003) also found that bank efficiency improved considerably after the Turkish financial system was liberalization during 1981–90.

In Ghana the increase in the number of foreign banks in the domestic banking sector has been drastic recent years. In fact, within the decade of 2000 the number of foreign banks in Ghana doubled and even equalled the number of domestic banks in the country. This quick growth in the operations of foreign banks has raised questions about the consequences of their presence for domestic banking markets. In theoretical literature there are basically three major consequences of the entry of foreign banks:

- The entry of foreign banks will affect competition.
- It would influence the efficiency performance of domestic banks in the banking sector.
- It would have an impact on the stability of the domestic banking system.

There is only limited empirical evidence on these consequences; Ghana is no exception. Thus, the main purpose of this research is to investigate the relative efficiency of banks; focusing on the banks operating in the Ghanaian financial system over the last nine (9) years (2000 – 2008). The study especially examines effects of the entry of foreign banks on the performance of domestic banks in the country. It is noteworthy to state that, the
entry of a new competitor may have a strong influence on market equilibrium and change competitive conditions in that market.

1.2 Statement of Problem

Since Ghana embarked on its financial sector reforms of liberalizing and internationalizing its domestic banking sector, the intent has been one of changing the competitive landscape of sector in order to increase efficiency and the competitiveness of the individual banks operating within the sector and the banking sector as a whole. Greater competition is needed for a number of reasons namely to enhance the efficiency of financial services, to help stimulate innovation, to contribute to stability, etc. There is evidence that competitive pressures are greater in those areas where foreign banks are active. Cho (1990) found that increase in the presence foreign bank in Indonesia contributed to increased competition in the banking industry. Several other authors conjecture that increases in foreign bank entry and foreign penetration in a domestic banking market increase competition and therefore act to compel domestic banks to operate more efficiently. See studies by Terrel (1986), Bhattacharaya (1997), McFadden (1994), Levine (1996), Kroszner (1998), Claessens and Jansen (2000), Peek and Rosengren, (2000), and Claessens, Demirgüç-Kunt and Huizinga (2001). Pearce et al, (2003) remarked: ‘New entrants to an industry bring new capacity, the desire to gain market share, and often substantial resources’. The potential positive effect of the entry of foreign banks into the Ghanaian banking sector is no exception.

It must be mentioned at this point that many emerging countries are constantly in a dilemma and are often hesitant as regards letting foreign banks enter their market. On one hand, governments fear that the entry of foreign banks could kill domestic banks. On the other hand, governments are willing to allow foreign banks to enter its banking sector because of the notion that foreign banks bring new product, new strategic and risk-management techniques, and sound corporate governance culture, which are developed in host countries. Hence, domestic banks might benefit from the spill-over effects and improve their economic efficiency.
Notwithstanding these financial sector reforms, which have greatly liberalised the banking sector of Ghana, a recent study by Buchs and Mathisen (2005), on the competitiveness and efficiency of the Ghanaian banking sector up to year 2003, stated that “banks in Ghana appear to behave in a non-competitive manner that could possibly hamper financial intermediation. This result is consistent with the seemingly high profitability of banks, which seems to indicate a persistently low level of market contestability”. The landscape of the Ghanaian banking sector has, however, changed drastically after their study. In fact the Ghanaian banking sector has grown from 16 banks to 24 banks by the end of 2008, diversified in geographical origin, corporate character and reach in the global financial markets. Over the past nine (9) years, the number of foreign banks has increased from a mean number of six (6) foreign banks as at the end of 2000 to twelve (12) banks. The Ghanaian banking saw a 100% increase in the number of foreign banks by the close of 2008. Thus, number of foreign banks has matched the number of domestic banks in Ghana. In the same period under consideration the number of domestic banks only increased by two (2) additional banks; closing at 12 banks in 2008 from 10 domestic banks in 2000.

Based on the above structure of the Ghanaian banking sector in recent times the questions one may want to ask are:

i. Is the Ghanaian banking sector now more competitive as more banks have entered the banking industry?

ii. Have the Ghanaian domestic banks taken advantage of the positive spill-over effects of the entry of foreign banks?

Answers to the above question can be obtained through a scientific research, hence this study. Also, this research to the best of the researcher’s knowledge is the first to be done on the Ghanaian banking sector with respect to analysing the effect that the entry of foreign banks into the local banking industry has had on the efficiency performance of the domestic banks. This researcher is of the view that it seems too early in a developing
The core question here is whether the Ghanaian banking sector has taken advantage of the benefits the entry of foreign banks/competition offers to the domestic banks in the industry.

1.3 Objectives of the Research

The objective of this study is to empirically examine the productivity and efficiency of the Ghanaian banking sector.

The specific objectives for the study are:

- To estimate the year on year technical efficiency scores of banks in the country for the period under study,
- Rank the banks in terms of technical efficiency to determine which ones are more efficient and which are less efficient,
- To study the relationship between the entry of foreign banks into the Ghanaian banking industry and the technical efficiency performance of the domestic banks.

1.4 Significance of the study

- This study would be helpful to bank managers in identifying their bank’s efficiency performance and the underlying reasons for their success or failure,
• Help policy makers in their attempts to improve the overall efficiency of the banking industry and identify the need for reforms of the domestic banks,
• Help academics in their continuous search for knowledge and theories. The research could serve as a reference point for further future research.

1.5 Scope and Limitations

1.5.1 Scope

The research used a panel study with data extracted from the annual profit and loss and end of year balance sheet statements of the banks. Year 2000 was used by this researcher as the starting year. There was also the requirement that a bank should have had at least two years of operations in order to be included in this study. Thus, based on this requirement, only 23 out of 24 banks in existence as of year 2008 were used in the sample. Thus the data to be used in is research was drawn from the annual financial statement data covering the period 2000 – 2008 for 23 banks; this gave a total of 173 observations. We had 173 observations because not all banks were in existence as at year 2000; some banks entered during the research period.

1.5.2 Limitations

• The sample about which the findings and conclusion are to be made from is one of the recent information from the banking industry. We recognize they could have been window-dressed by practitioners. We realize also that the data are not enough to test existing theories extensively.

• Financial constraint: Considering the fact that the researcher would have to use the internet for information on the topic, visit libraries for information, buy books and software, print, photocopy documents, etc which all involve finance, there is likely to be some financial difficulties on the part of the researcher. The money allocated for Thesis from the Ghana government is not sufficient to cover all the expenses that will be incurred by the researcher
Despite the above limitations, the researcher believes this research has been a valuable study because it has offered an original contribution to the knowledge on the effects of the entry of foreign banks on the banking sector in Ghana, given the acknowledged limited scope of our study.

1.6 Chapter Disposition

The study was organised in five chapters. Chapter one introduced the research topic, the problem statement, the objective and significance of study as well as highlighted on the scope and limitation of the study. Chapter two followed with a review of the theoretical and empirical issues regarding the current study. While Chapter three described thoroughly the methodology employed to achieve the research objectives. The methodology also explains the data used for the research and most importantly explains the models for the empirical investigation. Chapter four offered a report on the analysis, discussion and the presentation of results. Finally, chapter five covered a summary of the entire study with major findings clearly spelt out. Based on these, relevant and informed conclusions, as well as a thought out and coherent recommendations that are useful and practicable were made.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction:

This chapter examines the current structure of Ghanaian banking sector. It also thoroughly discusses the theoretical and empirical literature on the concepts of efficiency and productivity, measurements of the concepts as well as the approaches used in this process. It would also summarize the existing literature on the effect the entry of foreign banks into domestic markets poses to domestic bank technical efficiency performance.

2.2 Overview of the Ghanaian Banking Industry

By the year 2000 it became abundantly clear that the formal Ghanaian financial system was essentially made up of banking institutions (including the rural and community banks), insurance companies, discount houses, finance houses, leasing companies, savings and loans companies, credit unions, a stock exchange, stock brokerage houses and foreign exchange bureau. The banks, however, as a group, made up the largest component of this system; whether measured by assets or customer base. By 2003, the Ghanaian banking system was diverse. Eighteen (18) banks had been licensed and were in operations. By the traditional roles of the banks, Commercial banks were licensed by the regulator, the Bank of Ghana (BOG), to engage in traditional banking business, with a focus on universal retail services. Merchant banks were fee-based banking institutions and mostly engage in corporate banking services. Development banks specialized in the provision of medium- and long-term finance. Of these, there were nine (9) commercial banks, five (5) merchant banks, and three (3) development banks (as in the Table 1 below). 55 percent of total assets of the banking sector were owned by the three (3) largest commercial banks. This is quite moderate when we compare this with other countries in the region. A breakdown of the 55 percent, give the indication that about 25 percent of total assets and 20 percent of deposits are held by a single state owned commercial bank. As another group, about 30 percent of this market was shared by the
merchant banks and development banks, which by their traditional roles were into corporate banking and medium- and long-term financing respectively. Then we have the remaining six (6) commercial banks. These were the seemingly the small commercial banks which operated on a much smaller scale (Buchs and Mathisen, 2005)

Table 1: Structure of the Banking Sector as at 2003

<table>
<thead>
<tr>
<th>Banking System</th>
<th>Ownership (Percent)</th>
<th>Number of Branches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ghanaian</td>
<td>Foreign</td>
</tr>
<tr>
<td>Commercial Banks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank 1</td>
<td>97</td>
<td>3</td>
</tr>
<tr>
<td>Bank 2</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>Bank 3</td>
<td>24</td>
<td>76</td>
</tr>
<tr>
<td>Bank 4</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>Bank 5</td>
<td>39</td>
<td>61</td>
</tr>
<tr>
<td>Bank 6</td>
<td>53</td>
<td>47</td>
</tr>
<tr>
<td>Bank 7</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Bank 8</td>
<td>9</td>
<td>91</td>
</tr>
<tr>
<td>Bank 9</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Merchant Banks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank 10</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Bank 11</td>
<td>6</td>
<td>94</td>
</tr>
<tr>
<td>Bank 12</td>
<td>34</td>
<td>66</td>
</tr>
<tr>
<td>Bank 13</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Bank 14</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Development Banks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank 15</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Bank 16</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Bank 17</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Buchs and Mathisen, 2005

A cursory look at the above structure of the banking industry by the end of 2004 one gets an idea about the impact of the liberalization of the industry. The trend (as found in the Table 2 below) gives credence to the findings of Buchs and Mathisen (2005), which maintained that the Ghanaian banking industry has an uncompetitive structure. This can be worrying sign.
Table 2: Total number of banks and branches and proportion of total industry assets and branches owned by six biggest banks.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of banks</th>
<th>Proportion of industry assets owned banks %</th>
<th>Total number of bank branches</th>
<th>Proportion of branches owned by banks %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>16</td>
<td>85</td>
<td>304</td>
<td>86</td>
</tr>
<tr>
<td>2001</td>
<td>17</td>
<td>84</td>
<td>326</td>
<td>84</td>
</tr>
<tr>
<td>2002</td>
<td>17</td>
<td>82</td>
<td>322</td>
<td>83</td>
</tr>
<tr>
<td>2003</td>
<td>18</td>
<td>77</td>
<td>329</td>
<td>80</td>
</tr>
<tr>
<td>2004</td>
<td>18</td>
<td>73</td>
<td>384</td>
<td>73</td>
</tr>
</tbody>
</table>

Source: Akoena et al, 2009

Akoena et al (2009) states ‘Clearly, the proportion of total industry assets that belong to the six biggest banks has been overwhelming. The proportion has been falling but still remains substantial. This must be due to the increasing number of banks that are entering the industry, not to the decline in the total assets of each of these six banks they have increased from year-to-year’ in fact, when we look at these banks in terms of their branch network, the same scenario is present. These big six banks have had and continue to have a big majority of bank branches’

By the end of 2005 the banking sector in Ghana comprised twenty-one (21) Deposit Money Banks (DMBs) and 120 rural banks. The DMBs include eight (8) universal banks, two (2) merchant banks, three (3) development banks and eight (8) commercial Banks. However, by the end of 2008, with improved macroeconomic conditions and prospects, the banking industry had grown to twenty-five (25) licensed and operating Banks (also DMBs) and over 120 rural banks diversified in geographical origin, corporate character and reach in the global financial markets. Currently all banks in the country are operating as Universal Banks which opens endless opportunities to the product range that they may offer.

In line with financial sector reforms it has been reported that since 2003, Universal banking has replaced the three-pillar banking model – development, merchant and commercial banking. It has labelled the playing field, and opened up the system to
competition, product innovation and entry. The banking sector had since seen the arrival of many banks from the sub-region as it is the policy of the Bank of Ghana to register banks with international repute. The policy is geared toward supporting the development of a well capitalized and robust financial system. The licensing policy of the Bank of Ghana will continue to pursue the underlying objectives of establishing a unique and rich banking tradition. At this stage the entry of foreign banks would be limited to truly internationally active financial institutions (www.bog.gov.gh).

Table 3: Banks and their respective branch network in Ghana

<table>
<thead>
<tr>
<th>Name of Bank</th>
<th>Number of Branches</th>
<th>Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barclays Bank of Ghana Ltd</td>
<td>93</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>Ecobank Ghana Limited*</td>
<td>50</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>Ghana Commercial Bank Ltd*</td>
<td>153</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Merchant Bank (Ghana) Ltd</td>
<td>20</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>National Investment Bank Ltd</td>
<td>27</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Standard Chartered Bank Ghana Ltd*</td>
<td>21</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>SG-SSB Bank Limited*</td>
<td>39</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>The Trust Bank Limited</td>
<td>17</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Agricultural Development Bank Ltd</td>
<td>55</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Amalgamated Bank Limited</td>
<td>12</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>Prudential Bank Limited</td>
<td>18</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Fidelity Bank Limited</td>
<td>15</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Zenith Bank Limited</td>
<td>13</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>Stanbic Bank (Ghana) Limited</td>
<td>12</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>Unibank Ghana Limited</td>
<td>13</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Intercontinental Bank Limited</td>
<td>19</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>HFC Bank Ghana Limited*</td>
<td>19</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>First Atlantic Merchant Bank Ltd</td>
<td>6</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>International Commercial Bank Ltd</td>
<td>12</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>Guaranty Trust Bank Limited</td>
<td>17</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>CAL Bank Limited*</td>
<td>14</td>
<td>Ghanaian</td>
</tr>
<tr>
<td>United Bank for Africa (Gh) Ltd</td>
<td>24</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>Bank of Baroda Ghana Ltd**</td>
<td>1</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>BSIC**</td>
<td>4</td>
<td>Non-Ghanaian/Foreign</td>
</tr>
<tr>
<td>UT Bank Limited</td>
<td>11</td>
<td>Ghanaian</td>
</tr>
</tbody>
</table>

Source: MBG Research and Development Department, 2009.

* These banks are listed on the Ghana Stock Exchange
** Not part of this research
Table 3 above gives a breakdown of the various banks and their respective number of branches in Ghana as at first quarter of 2009. It also gives the ownership type of the banks.

2.2.1 Licensing of Banks in Ghana

In accordance with the Banking Act, 2004 (Act 673) as amended by the Banking (Amendment) Act, 2007 (Act 738), banks operating in Ghana at the moment must operate under the authority of the licence issued under the two main Classes. We have Class I and Class II banks.

2.2.1.1 Class I – General Banking

This is the general banking license given to all the banks in the country which grants them the permission to undertake the business of banking. In Ghana all the banks have this license type.

2.2.1.2 Class II - Off Shore Banking

Under this license the applicant must demonstrate that its risk-based capital ratios meet the minimum international standards established by the Bank for International Settlements (BIS). It must also be of sufficient size, experience and financial health to support the operations of the proposed IFC in Ghana. To meet these criteria, the applicant would generally be required to have the following:

i. A minimum of US$5.0 billion in consolidated assets
ii. A proven track record in international banking
iii. A favourable financial performance over the last five years and
iv. A controlling parent which is widely-held in its jurisdiction

By the end of 2008 only Barclays Bank Ghana Ltd. had the license to undertake Off-Shore banking.
In line with the universal banking licensing, therefore, the following requirements were placed on all existing banks in Ghana:

i. All domestic deposit money banks (majority owners are resident in Ghana) are to increase their minimum paid-up capital from 7 million Ghana cedi (approximately US$ 7 million at the time of announcement in 2008) to 25 million Ghana cedi by end 2010, then 60 million Ghana cedi by end 2012;

ii. All foreign owned deposit money banks (majority owners are non-residents) are to increase their minimum paid-up capital from 7 million Ghana cedi to between 50 and 60 million by the end of 2009.

2.2.2 State of Readiness of the industry in response to the New Directive

Table 4 below shows the end of year 2008 status of the banks on their preparedness to meeting the minimum capital requirement. We can see only MBG, GCB, and ADB have met this capital requirement. The last column of the table provides an idea of what additional capital the respective banks must raise to meet the requirement.

Table 4: Meeting the minimum capital requirement (Thousands of Ghana Cedis), 2008

<table>
<thead>
<tr>
<th>BANK</th>
<th>STATUS</th>
<th>STATED CAPITAL</th>
<th>MINIMUM CAPITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBG</td>
<td>FOREIGN</td>
<td>46,096.00</td>
<td>60,000</td>
</tr>
<tr>
<td>EBG</td>
<td>FOREIGN</td>
<td>16,400.00</td>
<td>60,000</td>
</tr>
<tr>
<td>SCB</td>
<td>FOREIGN</td>
<td>13,131.00</td>
<td>60,000</td>
</tr>
<tr>
<td>SG-SSB</td>
<td>FOREIGN</td>
<td>7,000.00</td>
<td>60,000</td>
</tr>
<tr>
<td>SBL</td>
<td>FOREIGN</td>
<td>18,325.00</td>
<td>60,000</td>
</tr>
<tr>
<td>ZBL</td>
<td>FOREIGN</td>
<td>34,778.00</td>
<td>60,000</td>
</tr>
<tr>
<td>IBG</td>
<td>FOREIGN</td>
<td>14,359.00</td>
<td>60,000</td>
</tr>
<tr>
<td>ICB</td>
<td>FOREIGN</td>
<td>7,759.00</td>
<td>60,000</td>
</tr>
<tr>
<td>GTB</td>
<td>FOREIGN</td>
<td>10,143.00</td>
<td>60,000</td>
</tr>
<tr>
<td>UBA</td>
<td>FOREIGN</td>
<td>17,508.00</td>
<td>60,000</td>
</tr>
</tbody>
</table>
Table 5: Summary of banks by ownership

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic</th>
<th>Foreign</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>10</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>2001</td>
<td>11</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>2002</td>
<td>11</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>2003</td>
<td>11</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>2004</td>
<td>11</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>2005</td>
<td>11</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>2006</td>
<td>12</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>2007</td>
<td>12</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>2008</td>
<td>12</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 5 provides a summary of total number of banks 2000 and 2008. It further provides a breakdown into the number of domestic banks and foreign banks in the industry for the same years. From a mean number of six (6) foreign banks as at the end of 2000, the Ghanaian banking has seen a 100% increase in the number of foreign banks to twelve (12) by the close of 2008. The number of foreign banks matched to the same number of domestic banks in Ghana.
2.2.3 Key Developments in the Regulatory Landscape between 2000 and 2008

Over the past nine years covering the period under study the Ghanaian banking industry has seen some major developments in terms of the industry’s regulatory environment. Such moves were aimed at impacting on a banks’ and industry’s way of conducting business and reporting results. The table below captures the major developments.

Table 6: Some key developments from 2000 to 2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Key Developments</th>
</tr>
</thead>
</table>
| 2003 | • Universal Banking License was introduced; banks with €70 billion (GH¢ 7million) in capital permitted to carry out any form of banking.  
• Maintenance, transaction, and transfer fees charges by commercial banks were abolished |
| 2004 | • The Banking Act 2004 (Act 673) replaced the Banking Law 1989 (PNDCL 225) |
| 2006 | • Secondary deposits reserves requirement (15%) was abolished  
• Foreign Exchange Act 2006 (Act 723) and  
• Whistle Blowers Act 2006 (Act 720) came into effect |
| 2007 | • Credit Reporting Act 2007 (Act 726) and  
• Banking (Amendment) Act 2007 (Act 738) were passed  
• National Reconstruction Levy was abolished  
• Re-denomination of the cedi (€10,000 = GH¢1) |
| 2008 | • Borrowers and Lenders Act, 2008 (Act 773),  
• Non-Banking Financial Institutions Act, 2008 (Act 774),  
• Home Mortgage Finance Act, 2008 (Act 770) and  
• Anti-Money Laundering Act, 2008 (Act 749) were passed  
• Banks to comply with International Financial Reporting Standards (IFRS) |

PricewaterhouseCoopers (2009)
2.3 The Concepts of Productivity and Efficiency

2.3.1 Productivity
Productivity is output per unit of input relationship. It is measured as amount of output per unit of input. The basic equation for productivity is as follows:

\[
\text{Productivity} = \frac{\text{Output Produced}}{\text{Resources Consumed}}
\]

The numerator of productivity formula may be the amount of product, volume of requirements, or value of the product (that is, things that flow into the process or subprocess). The denominator of productivity may be the amount and/or cost of the resources used during the production process.

2.3.2 Efficiency
The theoretical foundations of the concept of efficiency used here were laid by notable scholars like Debreu (1951), Koopmans (1951), Farrell (1957), and Färe et al (1985) while Hauner (2004) later provided extensive literature on the concepts. Efficiency could be construed as maximising value for shareholder through economies of scale, scope, output mix synergy and managerial efficiency. The benchmark of an efficient firm will be to produce more output (or a given mix or outputs) from a given mix of inputs. The measurement of efficiency was therefore initially performed in relation to the various industrial sectors of the real economy but in past 15 to 20 years the focus has shifted to the financial sector with an emphasis on researching the efficiency of banks’ Holló and Nagy (2006). We must note that the evaluation of the efficiency of individual firms is of fundamental importance for policymaking in many areas of finance and economics.

Efficiency is measured as the ratio of weighted outputs to weighted inputs and can take the values between zero and one. An efficient bank does not necessarily produce the
maximum level of output given the set of inputs. Rather, efficient bank means that the bank is a best practice bank in the sample (Reddy, 2003).

In fact bank productivity and efficiency have raised much interest in these recent years (Allen et al., 1996). A popular and notable scholarly work by (Berger & Humphrey, 1997), who did their research where they examined over 130 bank efficiency studies across the world, is such classic example. In essence, efficiency measurement in banking determines how banks provide an optimal combination of financial services with a given set of inputs.

The terms efficiency and productivity are related and are often used interchangeably, hence, for the rest of this thesis the researcher would use efficiency to stand for both efficiency and productivity.

2.3.3 Types of Efficiency
In the area of efficiency we the following types of efficiency:

i. **Cost efficiency (CE)** measures the possible reductions in cost that can be achieved if a bank is technically and allocatively efficient (Elyasiani and Mehdian, 1990). We can say: CE can be decomposed into allocative efficiency and technical efficiency or CE is the product of technical and allocative efficiency.

ii. **Allocative Efficiency (AE)** is related to the regulatory environment or macroeconomic conditions (Lovell and Schmidt, 1993). It's a measure of the ability of any DMU to use its inputs in such optimal proportion given their respective prices. That is the ability to select the optimal mix of inputs at given prices in order to produce a given level of outputs. Allocative inefficiency is the non-optimal use of inputs in the face of relative prices due to sloppy management or expense preference behaviour in which some inputs are preferred to others even if their use raises costs.
iii. **Technical efficiency (TE)** is more related to *managerial decisions* in any Decision Making Unit (DMU). TE refers to a DMU’s ability to produce the maximum outputs at a given level of inputs (known as the output orientation), or ability to use the minimum level of inputs at a given level of outputs (known as input orientation) (Farrell, 1957). It is measured by comparing observed and optimal values of production, costs, revenue, profit or all that the production system can follow as objective and which is under appropriate quantities and prices constraints. TE can be further decomposed into pure technical efficiency and scale efficiency.

The focus of this study is to measure technical efficiency (TE) of the banks in the Ghanaian banking industry.

### 2.4 Approaches for Estimating Technical Efficiency of Banks

There are a number of alternative methods for measuring bank efficiency. Berger et al. (1993), Berger and Humphrey (1997) and Berger and Mester (1997) are notable scholars who provided key surveys of the various alternative methods for measuring efficiency. The works amongst other things show two main approaches for measuring efficiency even though there is really no consensus on the most preferred method for determining the best-practice frontier against which relative efficiencies are measured. These methods are:

i. **Parametric Approach**

ii. **Non-Parametric Approach**

#### 2.4.1 Parametric Approach

In the parametric methods, one has to specify an explicit functional form for the frontier and econometrically estimate the parameters using sample data for inputs and outputs,
and hence the accuracy of the derived technical efficiency estimate is often sensitive to the nature of the functional form specified (Frimpong, 2010).

The parametric approach has:

The Stochastic Frontier Approach (SFA) - sometimes also referred to as the *econometric frontier approach* - specifies a functional form for the cost, profit, or production relationship among inputs, outputs, and environmental factors, and allows for random error. This approach was independently proposed by Aigner et al. (1977) and Meeusen and van den Broeck (1977). From that time it has been one of the major tools used for studying bank efficiency in individual countries as well as in cross-country analysis. Berger et al (2004), Bonin et al (2005), and Beccalli et al (2006) have all used this approach in their studies. The SFA treats the observed inefficiency of a bank as made up of the inefficiency specific to the bank and a random error, and tries to separate these two components by making explicit assumptions about the underlying inefficiency process. This approach usually makes the assumptions that the random error is a normally distributed variable and can affect the overall inefficiency in either way whilst the inefficiency term is assumed to be only one-sided and can affect the overall efficiency from only one direction Chen (2009).

Secondly, we have the Thick Frontier Approach (TFA), which specifies a functional form and assumes that deviations from predicted performance values within the highest and lowest performance quartiles of observations (stratified by size class) represent random error, while deviations in predicted performance between the highest and lowest quartiles represent inefficiencies.

Lastly, we have Distribution Free Approach (DFA), which was proposed by Schmidt and Sickles (1984) and Berger et al (1993). This approach follows a similar logic as the SFA. However, it is different from the SFA method because it does not apply the assumptions with respect to the distribution of the inefficiency component.
2.4.2 Non-Parametric Approach

Also described as *distribution-free tests*, non-parametric approaches are used to compare population where we cannot make, or are not prepared to make, the assumptions that:

i. The probability distributions are decidedly non-normal or
ii. One sample is more variable than the other sample, i.e. the standard deviation of the two populations are totally different

Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) are common approaches under non-parametric studies of efficiencies.

2.4.3 Data Envelopment Analysis (DEA)

The DEA is a popular approach to studying efficiency amongst DMUs. This method estimates the frontier essentially by using a non parametric mathematical linear programming. It offers an analysis based on the relative evaluation of the efficiency in an input/output multiple situations, by taking into account each bank and measuring its relative efficiency to an envelopment surface made up with the best banks. DEA does not require input or output prices in order to determine the best practice production frontier. The best practice frontier is identified as a piece-wise linear composite of observed best practices, given the specification of inputs and outputs. DEA generates a within-sample efficiency score between 0 (maximum inefficiency) and 1 (maximum efficiency).

This method, however, doesn’t allow for noise treatments. Non-parametric method has been usually used by making the assumption of constant return to scale (CRS). But recently, the assumption of variable return to scale (VRS) has been used in specifications because this hypothesis is more relevant with the environment of imperfect competition in which banks operate.
The basic idea underlying DEA is that if one producer is able to produce goods and services with a given input, then other producers must be able to do same if they operate efficiently. Thus outputs of producer A, B C, etc must be on the same production scale or schedule. By combining the efficiency scores of all the DMUs in any spectrum, a line of ‘best practice’ can be constructed. This line then serves as the benchmark for assessing the performance of individual units. If the line of ‘best practice’ is better than the original producer by either making more output with the same input (called output-oriented), or making the same output with less input (called input-oriented) then the original producer is inefficient.

Fig 1: Graphical presentation of measuring technical efficiency using DEA


Consider a firm that produces one output using two inputs case as represented by the in figure 2 above for illustration purposes, we can perform DEA technical efficiency measurement of DMUs. Let the horizontal and vertical axis be labelled as two inputs $X_1$ and $X_2$ respectively. Also, let us assume that the output quantity is given at a fixed level.
$Y^*$. Firms A, B, C, D, E constitute the ‘Best Practice’ production frontier, which is constructed as piece-wise linear convex when DEA is applied to sample data. Firm F is observed to be relatively inefficient because it tends to produce the same level of output employing the use of more of at least one input. From the diagram we can see that for firm F to produce $Y^*$, it uses the two inputs to the amount of $x_1^f$ to $x_1^c$ and $x_2$ to $x_2^c$ respectively. In order to be technically efficient, it could move to the point of Firm C on the frontier by proportionally reducing its usage of $x_1$ to $x_1^c$ and $x_2$ to $x_2^c$. We can term the distance CF represents technical inefficiency. This distance represents the amount by which inputs usage can be decreased to produce the same level of output if a firm were operating efficiently. DEA can give each firm a score bounded around zero (0) and one (1) to indicate the level of technical inefficiency. The score of technical efficiency (TE) is just the ratio of $OF$ relative to $OC$, as shown in figure 1. The distance OC and the ratio of OC to CF can be seen as the percentage by which the utilization of factors can be reduced without diminishing output.

This technique can also be extended to multiple outputs and multiple inputs.

**Advantages of DEA**

- The DEA approach does not require specification of any functional relationship between inputs and outputs or a priori specification of weights of inputs and outputs.
- It is especially suitable for measuring the efficiency of firms, which lack competitive prices, as in the case of the Ghanaian banking industry.
- Probability statements obtained from most non-parametric statistics are exact probabilities, regardless of the shape of the population distribution from which the random sample was drawn
- Treat samples made up of observations from several different populations.
- Can treat data which are inherently in ranks as well as data whose seemingly numerical scores have the strength in ranks

In Africa, Hauner and Peiris (2005) analysed the impact of banking sector reforms undertaken in Uganda with a view to improving competition and efficiency. They found that since the reforms the level of competition has increased significantly and has been associated with a rise in efficiency. Moreover, on average, larger banks and foreign-owned banks have become more efficient, while smaller banks have become less efficient in the face of increased competitive pressures. Efficiency is increasing in size and in the degree of portfolio diversification. Efficiency is decreasing in the ratio of administrative expenses to total assets suggesting that banks with higher intermediation efficiency also have higher productive efficiency as measured by their administrative costs.

In Ghana, Frimpong (2010) has used this same approach to investigate the efficiency of Ghana banks in the year 2007.

### 2.5 Selection of Input and Output

Literature does not provide a clear consensus in the frontier modelling regarding the specification of outputs and inputs. It is, however, commonly acknowledged that the choice of variables in efficiency studies can significantly affect the results. In assessing technical efficiency in banking studies, two approaches are usually used. They are the production approach and the intermediary approach (Chaffai, 1997) and
(Capizzi, 1999). In recent times the modern approach, the operating approach, the asset approach and the user cost approach are all other approaches advanced for the estimation of efficiency. See Das and Ghosh (2006), and Favero and Papi (1995).

The production approach highlights the commercial activities taking place in the banks, which is, producing deposits and loans and overdrafts. Thus, the approach models banks as using labour and physical capital to produce services for account holders, approximated by the number of transactions. This approach, however, fails to capture the economic role of a bank a financial intermediary and does not include interest expense, the largest portion of total costs.

Due to the weakness in the above approach we preferably adopt the intermediation approach, which models financial institutions as intermediating funds, hence transform and transfer financial assets from savers to borrowers. Also there is an increasing consensus that the intermediation approach constitutes a better instrument to study efficiency (Berger and Humphrey, 1997) and (Taylor et al., 1998).

2.6 Determinants of Technical Efficiency of Banks:

Across literature various factors have been identified as the determinants of a bank’s technical efficiency. The following factors are offered by Chen (2009) as determinants of efficiency:

i. Bank Specific Factors,

ii. Market Concentration & Competition

iii. Macroeconomic Environment.
2.6.1 Bank-Specific Factors

These are factors from within the bank which affect the efficiency performance of the bank. The following characteristics of a bank have identified to be factors that have the potential to determine and/or affect bank efficiency. They are:

2.6.1.1 Ownership

A relationship between bank efficiency and ownership may exist for foreign, domestic privately-owned banks, and publicly-owned banks. The kind of relationship is, however, not cast in steel. To a large extent the kind of economy determines the flow of the relationship. To this end, several studies have attempted to examine the relationship between efficiency and bank ownership. The general finding for most of these studies point out that the foreign banks tend to be more efficient than or at least as efficient as private domestic banks in developing economies and vice versa. Using 7,900 bank observations from 80 countries, Claessens et al. (2001) studied how some cardinals of efficiency such as net interest margins, overhead, taxes paid, and profitability differ between foreign and domestic banks. They found that foreign banks have higher profits than domestic banks in developing countries, but the opposite is the case for developed countries. They pointed out, however, that increased foreign ownership may result in reduction of profitability and margins for domestic banks. Also, Berger et al. (2004) in a study with a sample of banks in 28 developing countries found efficiency levels in the following order; foreign banks had the highest profit efficiency, followed by private domestic banks, and then state-owned banks. Claessens and Laeven (2004) found that countries with a higher share of foreign banks tended to experience lower average margins, and foreign bank entry imposes competitive pressure with resulting efficiency gains. Bonaccors Di Patti and Hardy (2005) found that foreign banks are more profit efficient than private domestic and state-owned banks in Pakistan.
2.6.1.2 Bank Capitalisation Ratio

What are the effects of capitalisation/capital adequacy? Capital requirement levels affect the profitability of commercial banks (Cheng, 2001a) with subsequent likely effect on the efficiency of the bank. For example, increasing capital levels lead banks to acquire more risky assets. Generally, the larger a bank’s capitalization, the larger a bank’s profit (Brock and Rojas-Suarez, 2000).

The major and/or alternative means of funding a bank’s operations is deposits from surplus economic agents. But it has been identified through research that banks that to a large extent rely on customer deposits for funding are less profitable. This is so because deposits could be very expensive as it could entail high cost of sourcing for them (an example is the high cost of fixed deposits and call accounts), high branch network expansion to increase the number of deposit generating outlets, and other expenses (Saunders and Schumacher, 2000). Banks pass on these operating costs to their depositors and lenders. Hence, capital is cheaper if not better. However, capital standards are not found to strengthen banks in emerging countries (Rojas-Suarez, 2001) and not surprisingly, the enforcement of Capital Adequacy Requirements (CARs) is found to reduce the supply of finance (Chiuri at al., 2002). In this fashion with the promulgation of the universal banking license in Ghana by BoG, there is the additional responsibility on the banks in the country to augment their capital base. The equity to assets ratio is used, and a positive relation between capital adequacy and efficiency is expected, as banks with a strong capital base are more able to expand their activities safely, avoiding excessive risks, and to face potential adverse developments. In addition, high equity levels can also be seen, Mester (1996), as a way for a bank’s shareholders to control its management by reducing moral hazard.

2.6.1.3 Profitability:

In finance the ratio of profit after tax to assets, popularly known as Return on Asset (ROA) is one of proxy to measure profitability of an entity. This cardinal is seen as one of the key determinants of technical efficiency. It is expected to be positively related to efficiency, since high profitability enables an entity to be able to invest in skilled
personnel with higher wages, and in improved technology, expecting that this increased cost will bring in much higher output gains. In line with this, in order to determine the efficiency of banks (Jackson and Fethi, 2000) employed profitability as another independent variable.

2.6.1.4 Liquidity Ratio:

Liquidity is the main blood of any bank. Thus, any risk related to a bank’s liquidity is an important risk for banks, as banks with high liquidity are much able to expand and/or face potential adverse developments in the economic environment better than those other banks that need to resort to stock markets to raise funds, especially when conditions in money markets become unfavourable. Although liquidity risk can be measured in different ways, this study uses the loans to total assets following the approach by Altunbas et al. (2000) and Havrylchyk (2005). Because the higher the ratio, the greater a bank needs to raise finance.

2.6.2 Market Structure/Market Concentration

The relationship between market structure and bank efficiency is crucial since the market could determine how well a bank performs. For starters we need to measure the degree of concentration within the market. In order to do this we can use:

i. Lerner index, which is defined as the weighted average of each firm’s margin with the weights given by the firm’s market share,

ii. Herfindahl-Hirschmann Index (HHI), which is calculated as the sum of the squared market shares of all the banks in the industry; the market share could be based on assets or deposits of each bank in the industry.
The researcher would preferably use the HHI to measure the concentration in the Ghanaian banking industry. It provides a better measure of market concentration because it takes the market share into consideration. Although the HHI is better it is harder to compute since you would need the market share for each and every firm in the industry.

2.6.3 Macroeconomic Conditions

Macroeconomics factors such as per capita GDP, inflation, interest rate, etc are factors which affect a bank’s efficiency. Chen (2009) estimates that higher income level brings higher cost efficiency. That is there was a positive relationship between cost efficiency to GDP. Also, the study found out that a higher inflation level tends to lower cost efficiency of banks.

Lensink and Hermes (2003) studied short-term effects of foreign bank presence on domestic bank performance, using data on 990 banks for the period 1990-1996. At the end of the day they found reason to argue that these effects are dependent on the level of economic development of the host country.

2.7 Estimation Model

Thus, once the relative technical efficiencies of the banks have been estimated, we can regress the technical efficiency scores obtained from the DEA as dependent variables against the relevant determinants of efficiency (Luoma et al., 1996), (Fethi et al., 2000) (Chilingerian, 1995) and (Hwang and Oh, 2008).

Tobit model is used in order to investigate the determinants of technical efficiency of Ghanaian banks. This is because the dependent variable, technical efficiency scores, ranges from 0 to 1. The adoption of this approach is in line with other studies that sought to investigate the determinants of efficiency Jackson and Fethi (2000) investigated the performance of Turkish commercial banks using DEA. Tobit model was first introduced
into econometrics literature by Tobin (1958). It is viewed as truncated or censored regression model where expected errors are not equal to zero. This study employed a two-stage process made up of DEA for the estimation of technical efficiency of the banks and a Tobit regression just as many recent scholars like Luoma et al. (1996) and Chilingerian (1995) have done in the health sector. Also, Viitala and Hanninen (1998) did same for public forestry organisations in Finland whilst Kirjavainen and Loikkanen (1998) applied both DEA and Tobit for the Finnish senior secondary schools.

2.8 Entry of Foreign Banks in Domestic Markets

2.8.1 Foreign Entry Defined:

Foreign bank entry can be viewed as the process by which foreign banks set up operations in a host country mainly by either opening up a branch or a subsidiary. The entry of foreign banks brings large benefits to a host country’s financial systems and economies at large. Benefits stem from efficiency gains brought about by new technologies, products and management techniques as well as from increased competition stimulated by new entrants (Cárdenas et al., 2003). In this paper a bank is classified as a foreign bank if the foreign ownership of the bank is more than 50 per cent otherwise where the foreign ownership is less than 50 the bank is classified as a domestic bank.

2.8.2 Empirical evidence of effects of the entry of foreign banks on the efficiency performance of domestic banks

Scholars such as Terrel (1986), Bhattacharaya et al. (1997), McFadden (1994), Levine (1996), Claessens and Jansen (2000), Claessens et al. (2001) have all conjectured that increases in foreign bank entry into domestic banking sectors increase competition, which compels domestic banks to operate more efficiently. The increase in the foreign banks may encourage domestic banks to reduce their costs, increase efficiency and increase the diversity of financial services through competition. Levine (1996) summarises that with the presence of foreign banks the domestic banks are pressured to improve the quality of
their services in order to retain their market shares. Also, Claessens, et al (2004) found that increases in the number of foreign banks in a country impose competitive pressure with resulting efficiency gains for the domestic banks in the country. Thus, foreign bank presence may engender an improvement in the quality of financial services provided by the domestic banks and also put old-style banking practices under pressure and ultimately force such old practices out of domestic banks.

Also the entry and increase in the number of foreign bank entry may lead to positive spill-over effects through the incorporation of new financial technologies, introducing new management methods and new financial products (Levine, 1996). It is worth noting that foreign banks bring new strategic and risk-management techniques, new services/product, and fresh and sound corporate governance culture, which may not be present in the host country. Potentially, domestic banks might benefit from such spill-over effects and subsequently improve their general economic efficiency. For example, once foreign banks introduce a new financial service(s) or modern and more efficient banking techniques, the domestic banks may be stimulated to also copy and/or develop similar products/services or technologies. This thus helps in improving the efficiency (especially the operational efficiency) of financial intermediation of the domestic financial market and the quality of banking in the host country. McFadden (1994) whose study focused on a review of foreign bank entry in Australia found that the entry has led to improved domestic bank operations. Denizer (2000) who examined the Turkish banking sector found out the effects of entry foreign banks into the banking sector are the reduced profitability and overhead expenses of the domestic banks. This he interpreted as evidence that improved efficiency for the domestic banks.

Furthermore, even though may be debatable, foreign bank entry may engender improvements of banking regulation and supervision in the host country, because the foreign banks may demand improved systems of banking regulation and supervision from the regulatory authorities in the host country. Thus, they enhance legislative framework, financial monitoring, reduces corruption and stimulates the development of transparent intermediary operations (Levine, 1996) refers.
Foreign bank presence may contribute to a reduced influence of the government on the domestic financial sector, which may reduce the importance of financial repressive policies, such as interest rate controls, directed credit policies, etc. Governments in many transition and developing economies have used (and sometimes still use) some or all of these financial repressive policies. Several studies have shown that such policies may reduce the efficiency of banks (Fry, 1995). Thus, by breaking the role of government in domestic financial markets, foreign bank presence may also contribute to improving the efficiency of domestic banks.

Entry may improve management of domestic banks and increase the quality of human resource capital in the domestic banking system in diverse ways. Firstly, if foreign banks import high skilled bank managers to work in their foreign branches, local employees/bankers may learn from the practices of these foreign bank managers. Secondly, foreign banks usually invest heavily in local employees through training and development programmes. Essentially though, the above may lead to more efficient domestic banking practices, with further potential resultant effects in reducing costs of banking services. It must be mentioned, however, such cost reductions may only occur in the longer term, because the banks may need to incur costs first to upgrade their staff.

2.8.3 Empirical Evidence on the Efficiency of Banks: Foreign Banks Vs. Domestic Banks

Without a doubt we can contend that empirical evidence on the effects of foreign banks’ entry on domestic banks’ behaviour and performance for developing economies is especially scarce. Many studies that have been conducted on bank efficiency and the role of foreign banks in host country economies have been focused on the US. European countries have also had attention but to a much smaller extent (Berger and Humphrey, 1997).
A most comprehensive empirical survey about foreign banks entry was carried out by Claessens et al. (2001) who investigated the relationship between foreign banks entry and the performance of the domestic banking sector in 80 countries. They used panel estimations with 7,900 bank observations for 1988–1995. The main result of the study was that foreign banks tend to have higher profits than domestic banks in the developing countries, while in developed countries foreign banks are less profitable than domestic banks. Lensink and Hermes (2003) provided further insight in the direction of this relationship. They studied how foreign banks entry effects are related, in a short term, with the economic development of the countries involved. Their findings indicated that that at a lower level of economic development, foreign banks entry is associated with higher costs and margins for domestic banks. However, at a higher level of economic development, foreign banks’ entry has a less significant effect on domestic banks’ performance (especially in terms of profitability). This result adds some support to the technology gap hypothesis.

In all these researches, however, we can see that there is no clear-cut efficiency level for both foreign and domestic banks. For example:

Research works have established that foreign banks tend to be less efficient than domestic banks in host countries in developed countries. Hasan and Hunter (1996) found out that Japanese multinational banks in the U.S. are, on average, less efficient than U.S. multinational banks. Also, Berger et al. (2000), on their study on Globalization of financial Institutions: Evidence from Cross-Border Banking Performance found that in developed economies foreign banks tended to have much lower efficiency scores in relation to the domestic banks’ efficiency performance. The above finding is, however, not cast in steel as other research work showed that foreign banks had higher efficiency scores than the domestic banks in some other developed countries. Hassan and Hunter (1996), who studied the cost and profit efficiencies of the Japanese banks and the domestic banks in the US for the period of 1984 to 1989 found out that Japanese bank operating in US were less cost and profit efficient than their US-owned counterparts. Other papers such as Chang et al. (1998) established a similar finding.
In developing and transition economies, however, the trend is quite different. In fact, a comparison of efficiency between foreign and domestic banks provides evidence that foreign banks in developing and transition economies have succeeded in capitalizing on their advantages and show a higher level of efficiency than their domestic peers Bonin et al. (2005), Isik and Hassan (2000), Hasan and Marton (2003), Bhattacharya et al. (1997) who found that foreign banks are slightly more efficient than domestic ones in India. We must note here that despite the fact that similar studies on both transition and developing markets lag far behind, results show that support for the assertion that foreign banks in such economies succeeded in exploiting their comparative advantages and reported higher efficiency as compared the domestic banks in the host country; Isik and Hassan (2000), Grigorian and Manole (2002), Hasan and Marton (2003), and Bhattacharya et al. (1997). A reason offered by scholars for this state is that foreign banks tend to enter both developing and developed economies for varied reasons. To Clarke et al. (2001) foreign banks do not just follow their customers into developing markets, but seem genuinely interested in exploiting local opportunities. Furthermore, several papers tested whether foreign and domestic banks came from the same population, in other words whether they operated in the same environment. These tests are especially important for efficiency studies in order to determine whether to construct separate or common frontiers for domestic and foreign banks. Both parametric and non-parametric tests usually failed to reject the null hypothesis that foreign and domestic banks came from the same population Isik and Hassan (2002) and Sathye (2001) refer.

That is to say efficiency comparisons between foreign and domestic banks in developing countries yield very different results. Claessens et al (2000), for example, confirmed this notion when found that the opposite is true in developing countries. This may give credence to Terrell (1986), who suggested that the reasons for foreign entry, as well as the competitive and regulatory conditions found abroad, differ significantly between developed and developing countries.
It is worth noting some scholars are of the impression that the opening up of domestic financial markets gives an indication that the view of governments with respect to the effects of foreign bank on domestic banks has changed for the better. Levine (1996), Buch (1997), Berger and Hannan (1998), and Stiglitz (1994) are all authors who have advanced arguments in support of the lifting of restrictions on foreign bank entry as they were of the view that such a move may positively influence domestic bank performance. In an early paper on this issue, Cho (1990), who did a study in the Indonesian banking industry, found out that foreign bank presence contributes to increased competition in the banking industry with the subsequent positive effect of competition. The most comprehensive study on the efficiency and competition effects of foreign banks’ entry is provided by Claessens et al. (2001). Using a large data set containing individual bank accounting information of domestic banks in 80 countries for the period of 1988 to 1995, they show that increased presence of foreign banks is associated with, non-interest income, the overall expenses of domestic banks and reductions of elements of profitability. Apparently, the competitive pressure of foreign banks leads to positive efficiency effects at domestic banks. Moreover, they find that these efficiency effects occur as soon as foreign banks enter the market; they do not seem to depend on the market share of foreign banks. Their conclusion is that foreign bank entry enhances efficiency and improves the functioning of domestic banks. It must be added that they did not, however, investigate whether or not the effects of foreign entry on domestic banks depend on the level of economic development of the host country. This could be a future research interest under this area of study.

On this same issue of foreign participation in the financial system of other economies, it is appropriate to mention that many studies have examined the relationship between efficiency and bank ownership. A general finding is that foreign banks are more efficient than or at least as efficient as private domestic banks. Berger, et al (2004) found foreign banks to have the highest profit efficiency, followed by private domestic banks, and then state-owned banks in a sample of 28 developing countries. For cost efficiency, private domestic banks rank higher than foreign banks. Claessens et al (2004) find that countries with higher share of foreign banks experience lower average margins, and foreign banks’
entry imposes competitive pressure with resulting efficiency gains. Bonaccorsi Di Patti and Hardy (2005) find that foreign banks are more profit efficient than private domestic and state-owned banks in Pakistan, but share similar average cost efficiency. Grigorian et al (2000) did an evaluation of the efficiency of transition countries banks focusing on Eastern Europe. This study was subsequent to banking system reforms/financial liberalization and the technological changes which occurred in the banking industry.

In Africa, Hauner et al (2005) analysed the impact of banking sector reforms undertaken in Uganda with a view to improving competition and efficiency. They found that since the reforms the level of competition has increased significantly and has been associated with a rise in efficiency. Moreover, on average, larger banks and foreign-owned banks have become more efficient, while smaller banks have become less efficient in the face of increased competitive pressures. Efficiency is increasing in size and in the degree of portfolio diversification. Efficiency is decreasing in the ratio of administrative expenses to total assets suggesting that banks with higher intermediation efficiency also have higher productive efficiency as measured by their administrative costs.

2.9 Efficiency Studies on Ghana

It must be noted that many works have been done on the efficiency of the banks in Ghana and the domestic banking industry as whole. There are a few researches worth noting, however:

Buchs and Mathisen (2005) found the Ghanaian banking industry to have a non-competitive market structure. They argued that this may be hampering financial intermediation. They also stated that, this structure, as well as the other market characteristics, constitutes an indirect barrier to entry thereby shielding the large profits in the Ghanaian banking system. Akoena et al. (2008) studied what would happen when banks get bigger. In order to assess this objective, they looked at technical efficiency and economies of scale of Ghanaian banks. The issue for them was: have large banks been
more efficient than small banks? Using the non-parametric approach of data envelopment analysis, their findings revealed that the technical efficiencies of large banks on one side and small banks on the other side are similar. Further, they established that small banks have larger scale efficiencies than the big banks. The implication of this is that (on the average at least) the large banks in Ghana are more removed from the point of their lowest average costs than the small banks. In the final analysis they cautioned that the central bank should be careful about encouraging banks to get bigger if its objective is to improve scale efficiency.

In a more recent study, Frimpong (2010) did a similar but only investigated the efficiency of Ghanaian banks for the year 2007 only. Using the DEA approach the study amongst other things found the average technical efficiency of the banking sector as at 2007 was 74%. The study also showed 18 banks in a sample of 22 banks were efficient; only 4 banks were efficient in 2007. In terms of group efficiency the study found that private domestic banks were the most technically efficient group followed by the foreign banks then the state-owned banks took the last position.

2.10 Rationale for research

This study uses the DEA to study the technical efficiencies of Ghanaian banks, with focus on the entry of foreign banks into the Ghanaian banking industry. DEA is a technique commonly used to evaluate the efficiency of a number of producers (referred to as DMUs). To the best of the researcher’s knowledge none has been done with focus on the impact of the entry of foreign banks into the Ghanaian banking industry. Therefore, as stated earlier, this paper will focus on measuring the technical efficiency between 2000 and 2008 for the Ghanaian banks in order to determine whether there was a rise in technical efficiency of these banks since of the entry of foreign banks into the Ghanaian banking industry in the study period.
CHAPTER THREE
METHODOLOGY

3.1 Introduction

The study evaluates bank efficiency and productivity of the Ghanaian banks with a particular focus on the effect of the entry of the foreign banks into the industry. The study uses a longitudinal data on 23 banks for the period 2000 to 2008. This chapter provides a brief description of the model selection, data sources and variable definition; it also provides hypotheses about relationships between efficiency and its potential determinants. The chapter starts with a description of the Data Envelopment Analysis (DEA) model, a non-parametric method for estimating efficiency followed by a specification of the relationship between efficiency and a set of covariates including capitalisation, industry concentration etc. Estimation method, data sources and variable definition follows in a sequence.

3.2 Estimation of Bank Technical Efficiency

As earlier mentioned, this study would use the DEA in order to achieve the objectives set at the heart of this study. This is an approach pioneered by Charnes, Cooper, and Rhodes (1978), CCR henceforth for short. Banker, Charnes, and Cooper (1984), BCC henceforth for short expanded it later. This approach breaks down cost (input saving) efficiency into Technical and Allocative Efficiencies. It further helps to breakdown technical efficiency into Pure Technical Efficiency and Scale Efficiency.

The DEA approach makes use of the statistical tool of Linear Programming (LP) of observed data to form an industry production frontier (Charnes et al, 1978 & 1994). It helps to measure the relative performance of decision making units (DMUs) within a particular sample where the presence of multiple inputs and outputs makes comparisons difficult. The essence of this approach is to measure relative efficiency among similar units that share the same technology (or processing procedure) for similar outputs by
using similar inputs. Each DMU gets a score bounded between zero and one; fully efficient banks will have an efficiency score of one and vice versa. The ability of the DEA to identify possible peers or role models as well as comparative simple efficiency scores gives it an edge over other methods. This study would allure to the CRS for our efficiency scores estimations of the banks in Ghana.

### 3.2.1 Mathematical Formulation of the DEA Model

In a multiple bank efficiency estimation case, efficiency is defined as the ratio of weighted sum of output over weighted sum of inputs.

The weights for the ratio are determined by the restriction that the similar ratios for every DMU has to be less than or equal to unity, thus reducing multiple inputs and outputs to a single “virtual” input and single “virtual” output without requiring pre-assigned weights. Therefore, the efficiency score is a function of the weights of the “virtual” input-output combination.

Under these circumstances, efficiency of a target unit can be obtained as a solution to the following efficiency maximising problem:

\[
\begin{align*}
\text{Max } h_c &= \sum_{r=1}^{s} u_r y_{rc} / \sum_{i=1}^{m} v_i x_{ic} \\
\text{s.t. } & \sum_{i=1}^{m} v_i x_{ij} \leq 1, \text{ for all } j ; \quad u_r, v_i \geq 0
\end{align*}
\]

where:
- \(c\) = a specific bank to be evaluated,
- \(y_{rj}\) = the amount of output \(r\) from bank \(j\),
- \(x_{ij}\) = the amount of input \(i\) to bank \(j\),
- \(u_r\) = weight chosen for output \(r\),
- \(v_i\) = weight chosen for input \(i\),
- \(n\) = number of banks,
- \(s\) = number of outputs,
- \(m\) = number of inputs.
In the above formula, \( h_c \) represents the objective function and we aim to maximize the weighed outputs to weighed inputs ratio of the banks within the sample that are being evaluated; subject to the constraint that no other bank within the sample that uses the same weights should obtain an efficiency score that exceeds unitary score. The weights are, however, unknown but can be obtained through optimization.

Formula 1 is in a fractional programme and it has the limitation of the possibility of giving infinite solution. Therefore, in order to avoid this limitation we can follow the linear programme form of Charnes et al. (1978), where we limit the denominator of the objective function \( h_c \) to unity and subsequently maximizing (minimizing) the numerator. The linear programme version of the fractional setting is given below as the input-oriented version (2) or as the output-oriented version (3):

**The Primal Problem**

\[
\begin{align*}
\text{Max } h_c &= \sum_{r=1}^{s} u_r y_{rc} \\
\text{s.t.} \quad &\sum_{i=1}^{m} v_{ij} x_{ij} = 1; \quad \sum_{r=1}^{s} u_r y_{rc} - \sum_{i=1}^{m} v_{ij} x_{ij} \leq 0; \quad u_r, \quad v_j \geq 0 \\
&\quad r = 1, \ldots, s; \quad i = 1, \ldots, m; \quad \text{and } j = 1, \ldots, n
\end{align*}
\]

**The Dual Problem**

\[
\begin{align*}
\text{Min } h_c &= \theta_c \\
\text{s.t.} \quad &\sum_{i=1}^{m} \lambda_i y_{ri} - y_{rc} \geq 0; \quad \theta_c x_{ic} - \sum_{i=1}^{m} \lambda_i x_{ri} \geq 0; \quad \lambda_j \geq 0
\end{align*}
\]
\( \theta_c \) is unconstrained in sign, \( j = 1, ..., n \) with \( \theta_c \) and \( \lambda_j \) as dual values. \( \lambda_j \) represents input and output weights of other banks in the sample.

The efficiency scores are bounded between 0 and 1, where 0 is maximum inefficiency and 1 is maximum efficiency. Thus, by the function above, bank \( c \) would be considered as efficient if its corresponding \( \theta_c \) is equal to one (1) and the least efficient if corresponding \( \theta_c \) is equal to zero (0). So that as a bank moves from 1 to 0 represents a movement from efficiency to inefficiency.

For us to be able to obtain estimates for \( n \) banks, the optimizing system (primal or dual) must be run \( n \) times each time the bank under evaluation changes. The version considered above, commonly referred to as CCR model after Charnes, Cooper and Rhodes, (1978) works with constant returns to scale.

### 3.3 Determinants of Technical Efficiency of Ghanaian Domestic Banks

There has been considerable interest to explain DEA efficiency scores by investigating the determinants of technical efficiency. Financial and economic literature identify several factors including bank size, ownership, industry concentration, economic activity (GDP, inflation, economic development, etc.), market share, risk and a vector of other determinants as impacting bank efficiency in the banking industry, see Chen (2009); Hasan and Hunter (1996); Hasan and Marton (2000) Chang, Hasan and Hunter (1998) among others.

This study adopts the model by Lensink and Hermes (2003) with slight modifications to suit this particular study. The point of departure between this study and that of the former study is the fact this study focuses on technical efficiency as the dependent variable whilst former focuses variables of interest to bank a bank such as Net Margin to Total
Asset, Loan Loss Provisioning to Total Asset, etc as their dependent variables. The following are the estimated equations:

$$\text{EFF}_{it} = \beta_0 + \beta_1 \text{ROA}_{it} + \beta_2 \text{LIQ}_{it} + \beta_3 \text{CAP}_{it} + \beta_4 \text{HHI}_t + \beta_5 \text{INFL}_t + \beta_6 \text{FS}_t + \varepsilon_{it}$$

\( \text{EFF}_{it} = \quad \text{Technical Efficiency} \)

Technical efficiency computed for bank \( i \) at time \( t \). It represents the dependent variable in the regression. The sensitivity of banks' technical efficiency measured by the coefficients to the determinants of efficiency is one of the core focuses of this paper.

The following are the independent variables to be used in the regression:

\( \text{ROA}_{it} = \quad \text{Return on Asset (Profitability)} \)

\( \text{ROA} = \frac{\text{Profit after tax}}{\text{Total Assets}} \)

We expect a positive coefficient and statistically significant relationship between ROA and the technical efficiency of banks.

\( \text{LIQ}_{it} = \quad \text{Liquidity Ratio} \)

This is measured by the total loans and advances divided by the total assets of bank \( i \) at time \( t \). It indicates liquidity ratios. Higher ratios may be suggestive of better bank performance because increases in loans and advances very likely reflect in increases in interest income and subsequently positive effects on the bottom-line. However, very high ratios have the potential of reducing liquidity (and the need to raise more liquidity at higher costs) as well as possible increases in the number of loan defaults by borrowers. The effect of this variable on technical efficiency is, thus, ambiguous.

\( \text{CAP}_{it} = \quad \text{Bank Capitalisation Ratio} \)

This is measured as equity over total assets of a bank \( i \) at time \( t \). We expect a positive relationship between technical efficiency and the above independent variable.
The Herfindahl-Hirschmann Index (HHI), a measure of concentration is the sum of squares of the market share of the all firms in the industry; it is measured as follows:

\[ HHI = 10,000 \times \sum_{i=1}^{l} MS_i^2 \]

where:
MS = Total assets in firm \( i \) divided by total assets of the industry.

More specifically, the market structure is categorized based on the value of H:

- if HHI = 1, monopoly or perfect cartel;
- if HHI = (0 < HHI < 1), monopolistic competition or oligopoly; and
- if HHI = 0, perfect competition.

Like size, no clear conclusive evidence exists on the exact impact of competition on efficiency. For instance Hao et al. (2001) suggest that liberalization of the financial sector did not improve efficiency whiles Chen (2009) found competition as important determinant of efficiency. Subsequently, we expect a positive coefficient relationship between HHI and the technical efficiency of banks in Ghana.

\[ INFL_t = \text{Inflation} \]

Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services. We expect that inflation would have a negative relationship with technical efficiency of banks in the country.

\[ FS_t = \text{Foreign Share (Presence)} \]

Since our main target is to determine the relationship between the effects of the entry of foreign banks on the technical efficiency performance of domestic bank, we introduce an
independent variable called foreign share (FS). FS represents the share of foreign banks at time $t$. That is it is the share of foreign banks’ assets to total assets of the industry in the country. A positive sign is expected since increasing the presence of foreign banks in a market may lead to stronger competition and subsequently lead to better technical efficiency of banks in the country.

$$\varepsilon_{i,t} \quad = \quad \text{Error Term}$$

### 3.4 Estimation Method

As explained in chapter 2, the technical efficiency scores computed in the first stage are the dependent variables in the second stage where a regression would be run using the Tobit model. A panel version of censored Tobit model is used. The panel data model is specified as

$$y_{i,t}^* = \beta' x_{i,t} + \varepsilon_{i,t}$$

Where $\varepsilon_{i,t} \sim N (0, \sigma^2)$ and $y_{i,t} = y_{i,t}^*$ if $100 \geq y_{i,t}^* \geq 0$ and $y_{i,t}^* = 0$ or is observed to be missing $100 \leq y_{i,t}^* \leq 0$, (see Cameron and Trivedi, 2005 for detailed description of the panel). The choice of panel version of the Tobit model is due to the fact that DEA efficiency scores lies between an interval of 0 and 1, thus dependent variable is ‘a limited dependent variable’. This model has the strength of estimating equations whose dependent variable values are restricted within some range. Thus it is preferred estimation model. The dependent variable efficiency assumes censored or truncated values as follows:

$$TE_{i,t} = \begin{cases} 
    y_{i,t}^* \geq 0; \text{ left censored} \\
    y_{i,t}^* \leq 100; \text{ right censored}
\end{cases}$$
3.5 Data and specification of Inputs and Outputs

The research would use an unbalanced longitudinal (panel) data covering only 23 banks for the period 2000 to 2008 for this study. Annual individual bank balance sheets and income statements from 23 banks in operation between 2000 and 2008 have been used to construct the input and output data set.

As already stated in chapter 2, the study would employ an intermediation approach whereby financial institutions are viewed as intermediating funds between savers and investors at the least cost. Banks largely produce intermediation services through the collection of deposits and other liabilities and their application in interest-earning assets. Barr et al. (1994) and Sathye (2003) are examples of research studies that adopted this approach in assessing banking efficiency. The base currency of Ghana is the Ghana cedi so all input and output variables are measured in Ghana cedis subsequently. In that regard we have the specific input, output combination as can be found below:

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Assets</td>
<td>Loans (including advances &amp; overdraft)</td>
</tr>
<tr>
<td>Deposits</td>
<td>Investments in securities</td>
</tr>
<tr>
<td>Total Cost</td>
<td>Total Revenue</td>
</tr>
<tr>
<td>Shareholders’ Equity</td>
<td>Deposits with other banks</td>
</tr>
</tbody>
</table>
CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Introduction
In this chapter, we analysed our results after using models specified in chapter 3 to compute the technical efficiency of 23 out of 26 banks included in this research for the period of 2000 to 2008. The data used is annual data covering the period 2000 – 2008 for 23 banks gave a total of 173 observations. We also rank the banks in terms of their relative average efficiency score for the entire research period. We also determine the relationship between the performance of the foreign banks and domestic banks as separate groups. Before explaining the regression results from our model, however, we provided a summary statistics of the variables used in our regression estimate and also indicated how the variables specified are correlated.

4.2 Descriptive Statistics
Table 7 contains the technical efficiency scores of the 23 banks used in research sample from 2000 to 2008. The scores were computed using GAMS 20.0.

Table 7: Year by year, bank by bank efficiency scores for 2000 – 2008

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank 1</td>
<td>0.98</td>
<td>0.99</td>
<td>0.72</td>
<td>0.90</td>
<td>0.80</td>
<td>0.69</td>
<td>0.67</td>
<td>0.55</td>
<td>0.72</td>
</tr>
<tr>
<td>Bank 2</td>
<td>0.35</td>
<td>0.88</td>
<td>0.83</td>
<td>1.00</td>
<td>0.73</td>
<td>0.65</td>
<td>0.53</td>
<td>0.68</td>
<td>0.67</td>
</tr>
<tr>
<td>Bank 3</td>
<td>0.77</td>
<td>1.00</td>
<td>0.99</td>
<td>1.00</td>
<td>0.96</td>
<td>0.93</td>
<td>0.94</td>
<td>0.78</td>
<td>0.69</td>
</tr>
<tr>
<td>Bank 4</td>
<td>0.85</td>
<td>1.00</td>
<td>0.83</td>
<td>0.71</td>
<td>0.72</td>
<td>0.67</td>
<td>0.60</td>
<td>0.52</td>
<td>0.53</td>
</tr>
<tr>
<td>Bank 5</td>
<td>0.92</td>
<td>0.85</td>
<td>0.97</td>
<td>0.89</td>
<td>0.96</td>
<td>0.98</td>
<td>0.97</td>
<td>0.89</td>
<td>0.67</td>
</tr>
<tr>
<td>Bank 6</td>
<td>0.77</td>
<td>0.79</td>
<td>0.74</td>
<td>0.81</td>
<td>0.86</td>
<td>0.97</td>
<td>0.99</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Bank 7</td>
<td>0.60</td>
<td>0.86</td>
<td>0.70</td>
<td>0.68</td>
<td>0.76</td>
<td>0.62</td>
<td>0.80</td>
<td>0.76</td>
<td>0.82</td>
</tr>
<tr>
<td>Bank 13</td>
<td>0.74</td>
<td>0.74</td>
<td>0.68</td>
<td>0.78</td>
<td>0.77</td>
<td>0.92</td>
<td>0.92</td>
<td>0.86</td>
<td>0.81</td>
</tr>
<tr>
<td>Bank 15</td>
<td>0.92</td>
<td>0.91</td>
<td>0.84</td>
<td>0.93</td>
<td>0.95</td>
<td>0.71</td>
<td>0.63</td>
<td>0.58</td>
<td>0.71</td>
</tr>
<tr>
<td>Bank 16</td>
<td>0.88</td>
<td>0.93</td>
<td>0.95</td>
<td>0.96</td>
<td>0.95</td>
<td>0.89</td>
<td>0.87</td>
<td>0.87</td>
<td>0.77</td>
</tr>
</tbody>
</table>
Table 7 shows the technical efficiency scores for the individual banks from 2000 to 2008. One striking observation is that private domestic banks, namely Bank 22, Bank 11 and Bank 8, who entered the industry over the research period all obtained higher initial technical efficiency scores as compared to their foreign counterparts who also entered during the same research period. These foreign banks namely Bank 21, Bank 10, Bank 23 and Bank 12 were all from Nigeria. Of these foreign banks in question only Bank 12 obtained an above 0.50 technical efficiency score. This may be because it acquired an already established savings and loans company. Bank 12 thus had its customers (assets and liabilities), trained staff, established branches from the start unlike its Nigerian counterparts who had to struggle to start their operations from scratch. Another argument that could be advanced for the low efficiency scores obtained by these Nigerian banks is the fact that the Ghanaians were initially apprehensive of what future would if they should commit their funds to these Nigerian banks. This apprehension stemmed from past experience with other Nigerian banks that eventually ran off this country with the deposits and other investments of customers. Results of 2008 show that Ghanaians have accepted the fact that these Nigerian banks are here to stay.
Table 8: Ranking banks by their overall average efficiency

<table>
<thead>
<tr>
<th>Bank</th>
<th># of Years</th>
<th>Overall Bank EFF</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank 16</td>
<td>9</td>
<td>0.904</td>
<td>1</td>
</tr>
<tr>
<td>Bank 6</td>
<td>9</td>
<td>0.897</td>
<td>2</td>
</tr>
<tr>
<td>Bank 20</td>
<td>9</td>
<td>0.896</td>
<td>3</td>
</tr>
<tr>
<td>Bank 3</td>
<td>9</td>
<td>0.895</td>
<td>4</td>
</tr>
<tr>
<td>Bank 11</td>
<td>6</td>
<td>0.894</td>
<td>5</td>
</tr>
<tr>
<td>Bank 5</td>
<td>9</td>
<td>0.867</td>
<td>6</td>
</tr>
<tr>
<td>Bank 7</td>
<td>9</td>
<td>0.867</td>
<td>6</td>
</tr>
<tr>
<td>Bank 18</td>
<td>9</td>
<td>0.860</td>
<td>8</td>
</tr>
<tr>
<td>Bank 8</td>
<td>3</td>
<td>0.839</td>
<td>9</td>
</tr>
<tr>
<td>Bank 9</td>
<td>9</td>
<td>0.811</td>
<td>10</td>
</tr>
<tr>
<td>Bank 17</td>
<td>9</td>
<td>0.809</td>
<td>11</td>
</tr>
<tr>
<td>Bank 14</td>
<td>9</td>
<td>0.804</td>
<td>12</td>
</tr>
<tr>
<td>Bank 15</td>
<td>9</td>
<td>0.797</td>
<td>13</td>
</tr>
<tr>
<td>Bank 19</td>
<td>9</td>
<td>0.788</td>
<td>14</td>
</tr>
<tr>
<td>Bank 1</td>
<td>9</td>
<td>0.780</td>
<td>15</td>
</tr>
<tr>
<td>Bank 13</td>
<td>9</td>
<td>0.733</td>
<td>16</td>
</tr>
<tr>
<td>Bank 12</td>
<td>2</td>
<td>0.722</td>
<td>17</td>
</tr>
<tr>
<td>Bank 4</td>
<td>9</td>
<td>0.715</td>
<td>18</td>
</tr>
<tr>
<td>Bank 2</td>
<td>9</td>
<td>0.703</td>
<td>19</td>
</tr>
<tr>
<td>Bank 23</td>
<td>3</td>
<td>0.584</td>
<td>20</td>
</tr>
<tr>
<td>Bank 22</td>
<td>9</td>
<td>0.570</td>
<td>21</td>
</tr>
<tr>
<td>Bank 21</td>
<td>4</td>
<td>0.552</td>
<td>22</td>
</tr>
<tr>
<td>Bank 10</td>
<td>3</td>
<td>0.339</td>
<td>23</td>
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</table>

Table 8 shows the ranking of the banks in terms of their overall average technical efficiency scores for the number of years they have been in operations. The ranking was from the most efficient bank to the least efficient bank; given the range of technical efficiency scores we have.

From the above table, Bank 16, Bank 6, Bank 20, and Bank 3 topped the other banks in terms of their overall efficiency for the research period. One would expect banks such as Bank 9, Bank 1 and Bank 18 to have been part of the industry leaders in terms of technical efficiency since they have a good share of the market, they have the name and have been in existence for a while. The implication of failure of Bank 9, Bank 1 and Bank 18 to equally obtain high scores is that market share, number of years of existence
and name do not necessarily translate into high technical efficiency. Rather it is how a bank maximises its output given its input or how a bank minimises its input consumption given its outputs is what matters. It is, however, surprising that banks like Bank 6 and Bank 3 made the mark to join the leaders.

Amongst the state banks, namely Bank 1, Bank 9 and Bank 15, only Bank 9 broke into the top 10. The low technical efficiency performance/ranking is, however, not surprising since it is line with literature that state banks are less efficient when compared with banks having other forms of ownership. Since the introduction of the universal banking license in 2003, which broke the monopoly these state banks enjoyed, the technical efficiency performances of these state banks have continued to dip over the years subsequently.

The bottom position were taken by the newer banks in the industry; notably the Nigerian banks. This was expected as their performance by the end of 2008 has not been up to scratch. Bank 12, a new bank and also Nigerian bank took the 17th position beating existing banks like Bank 2 and Bank 4. It is no surprise because much unlike the other Nigerian banks that were at the bottom of the rankings, Bank 12 acquired an existing savings and loans company. Thus, it had its customer base from the word go.

4.3 Determinants of Technical Efficiency in the Ghanaian Banking Industry

4.3.1 Correlation Analysis

We first tested for possible degree of multi-collinearity among the regressors by including a correlation matrix of the variables in Table 9. Overall, it can be concluded that the magnitude of the correlation coefficient indicates that multi-collinearity is not a potential problem in the regression model and that the dataset together with the variables are appropriate for the study. One can see from the correlation matrix table below the highest correlation was between HHI and ROA with 0.4765.
Table 9: Correlation matrix for Determinants of Technical Efficiency

<table>
<thead>
<tr>
<th></th>
<th>EFF</th>
<th>ROA</th>
<th>LIQ</th>
<th>CAP</th>
<th>HHI</th>
<th>INFL</th>
<th>FS</th>
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</thead>
<tbody>
<tr>
<td>EFF</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ROA</td>
<td>0.5062</td>
<td>1.0000</td>
<td></td>
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<td></td>
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<td>0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIQ</td>
<td>-0.0742</td>
<td>0.2314</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>0.4679</td>
<td>0.0219</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAP</td>
<td>-0.5118</td>
<td>-0.7705</td>
<td>-0.1906</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0601</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HHI</td>
<td>0.0979</td>
<td>0.4765</td>
<td>0.2955</td>
<td>-0.6154</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.3373</td>
<td>0.0000</td>
<td>0.0031</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFL</td>
<td>0.1271</td>
<td>0.0950</td>
<td>-0.2793</td>
<td>0.0321</td>
<td>-0.0596</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2124</td>
<td>0.3521</td>
<td>0.0054</td>
<td>0.7540</td>
<td>0.5601</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>-0.0225</td>
<td>-0.1173</td>
<td>0.2828</td>
<td>-0.0913</td>
<td>0.0779</td>
<td>-0.7698</td>
<td>1.0000</td>
</tr>
<tr>
<td></td>
<td>0.8257</td>
<td>0.2499</td>
<td>0.0048</td>
<td>0.3713</td>
<td>0.4455</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

4.3.2 Regression Estimation Results

Table 10 below shows the regression results under tobit estimation for the determinants of bank technical efficiency. It made up of a two-stage regression. The first regression focused on the determinants of technical efficiency amongst domestic banks. In the second regression we introduced foreign share (FS) variable, in line with a study by Lensink and Hermes (2004), in order to test the effect the entry of foreign banks have had the domestic banks in the Ghanaian banking sector. It is important to note that the dependent variable for the banks is the technical efficiency computed using the DEA for the research period. A positive coefficient implies that technical efficiency increases as the independent variable(s) increase. On the other hand, a negative coefficient means that as the independent variables increase the technical efficiency of the bank(s) declines or whilst the independent variables decrease technical efficiency increases. The results of the regression are significant at 1%, 5% or 10% respectively. The regression was run using STATA 11.
Table 10: Tobit regression of the effect of the entry of foreign banks on the technical efficiency performance of domestic bank

| EFF  | Coef.     | Std. Err. | z     | P>|z| |
|------|-----------|-----------|-------|-----|
| ROA  | 1.1995090 | 0.5279102 | 2.27  | 0.023 |
| LIQ  | -0.1903728| 0.0919909 | -2.07 | 0.039 |
| CAP  | -0.8915501| 0.3251967 | -2.74 | 0.006 |
| HHI  | -0.0550362| 0.0201954 | -2.73 | 0.006 |
| INFL | 0.3544984 | 0.1833930 | 1.93  | 0.053 |
| FS   | 1.8148690 | 0.9643440 | 1.88  | 0.060 |
| CONS | -0.0079280| 0.4985871 | -0.02 | 0.987 |

Number of obs 98
Wald chi2 (5) 57.8
Log likelihood 79.641191
Prob > chi2 0.0000

ROA had a positive coefficient and was statistically significant in the regression output. The regression output met our expectation at 5% level of significance. The results imply that profitability has a major impact on efficiency of domestic banks in Ghana. Thus, the higher the profit level, the higher the technical efficiency of the domestic bank whilst the lower the profit level the lower technical efficiency of the domestic banks in Ghana. The results from this study was in line with similar findings of scholars such as Jackson and Fethi (2000), Christopoulos et al. (2002) and Altunbas et al. (2000) as well as findings for developed banking economies (Berger and Humphrey, 1997). Similarly Isik and Hassan (2002) reported a positive coefficient relationship of ROA to technical efficiency for the Turkish banking industry.

The coefficient of liquidity ratio (LIQ) in the regression was negative and statistically significant under 5% significance level as well. A high LIQ ratio has the potential of increasing the number of loan defaults by borrowers, which could subsequently lead to a reduction in a bank’s profitability because of high bad debts write off. Also, the result makes sense because very high ratios (that is high loans to total assets ratio) have the potential of reducing liquidity (that is the need to raise more liquidity at higher costs) and vice versa. Again, Liquidity problems can also result in huge fines and/or charges being
levelled against an offending bank by BoG because of the bank’s inability to meet the prudential requirements of BoG; where such a situation occurs a slur is cast on the creditability of the bank as a financial institution. Also, bank with liquidity issue would not be able to advance further credit facilities to a requesting customer. Such a situation results in a loss of potential interest income and as well as a decrease in the bank’s profitability. The results of this study for both regressions are consistent with the findings of a similar study by Asimakopoulous et al. (2008) with a specific reference to the Greek banking system.

The bank capitalisation ratio indicates the coverage of banks’ assets by owners’ funds. A positive relationship was expected between technical efficiency and bank capitalisation ratio as were in the cases of Casu and Girardone (2004), Mester (1996) but the opposite was the case. It, however, fell in line with similar studies by Kiyota (2009), who did a study on efficiency of commercial banks in Sub-Saharan Africa with the main focus on the comparative analysis of domestic and foreign banks. The relationship was expectedly significant in line with the work of Jackson and Fethi (2000) and Barry et al. (2008). The findings seem to suggest that the more efficient banks use less equity and that the less efficient banks tend to hold more equity. If there is excess capital sitting idle, it does not generate any income or financial benefits. Such excess capital could have ordinarily been given out as credit facilities to customers, continuously invested on overnight market/treasury market, lent to other financial institutions, used to support foreign trade operations/trade finance, etc.

HHI coefficient reported a negative and statistically significant effect on the technical efficiency of banks over the period of study. Thus, the more concentrated the industry is the more the technical efficiency of banks improves. This is understandable to the extent that where there are more banks in an industry there is intense competition. This intense competition pressures the banks to do things more efficiently. This may suggest that high concentration is associated with efficient resource allocation and efficiencies in the system. Our result is line with that of Asimakopoulous et al. (2008).
The relationship between inflation and technical efficiency was positive in the regression and it was statistically significant under 10% in the first regression. This means that at high inflation levels, technical efficiency of domestic banks rise whilst technical efficiency would reduce when inflation falls. This is because, to a large extent, banks do not factor the inflation into the price they pay on their deposits as much as they factor inflation into the price they charge for loans and advances. Thus, in inflationary periods the banks wider or larger spread (interest income minus interest expense). The large spread then increase the profit levels which subsequently increase technical efficiency.

The focus of this study, amongst other things, was to test whether or not the entry of the foreign banks into the Ghanaian banking sector has had an effect on the technical efficiency performance of domestic banks. The foreign share (FS) variable was introduced in line with the work of (Lensink and Hermes, 2004) as a proxy to test this effect. At the end of the day the test reported a positive and statistically significant coefficient relationship between technical efficiency of the domestic bank and the foreign share proxy. This result confirms the notion that entry of foreign banks has had a positive and significant effect on the technical efficiency performance of domestic banks in Ghana. As evidence we can talk of the spill over effects and other tremendous positive changes we have seen within the banking sector in recent times. Examples include the affordability of banking services to bank customers because of competitive pricing amongst the banks, the new and better technologies and practices introduced by the foreign banks thereby improving service delivery and cutting the cost of producing bank services, banks now hiring highly educated/skilled staff for all levels of service production and delivery; which potentially leads to increased output, etc.
CHAPTER FIVE
SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

5.1 Summary

This thesis examined the technical efficiency of the Ghanaian banking industry with specific reference to the effect of the entry of foreign banks over 2000 to 2008. The essence was to assess if the entry of foreign banks has had any effect on the technical efficiency performance the domestic banks in Ghana. This thesis was a two-stage process.

Firstly, in order to compute the technical efficiency scores of the 23 banks used in the research the researcher used the data envelopment analysis (DEA) approach, which is a method that has been used by scholars like Jackson and Fethi (2000). The technical efficiency scores so computed helped us to determine the efficiency performance of each of the banks over the period under study. We were then able to rank the individual banks on technical efficiency performance over the research period.

The second stage involved a regression analysis; we looked at the determinants of technical efficiency of domestic banks. For this regression, the thesis used a similar model employed by Claessens et al (2001) and also of Lensink and Hermes (2004) in their studies on the Polish banking industry to test the effect the entry of foreign banks has had on the technical efficiency of the domestic banks. Here, we used the technical efficiency scores estimated with the DEA as dependent variable and ran a tobit regression. The independent variables used in the regression were the main determinants of technical efficiency plus additional proxy to represent the entry of foreign banks. As already mentioned above this proxy used to represent the entry of the foreign banks was introduced in line with other works that also sought to measure the effect that foreign entry had on other economies. We were able to confirm the widely held view that the entry of foreign banks has had a positive and statistically significant effect on the efficiency of the domestic banks.
5.2 Conclusion

The objective of this paper was to apply DEA to investigate the recent technical efficiency performance of banks in Ghana and also to assess the impact the entry of foreign banks has had on domestic banks’ technical efficiency performance. The lack of empirical studies, which focus on the analysis of the effect of foreign banks’ entry on efficiency, motivated this study.

Also, the effect the entry of foreign banks into Ghana on the technical efficiency performance of domestic banks can be seen as positive in terms of their contribution to creating a competitive banking environment and improving the overall technical efficiency performance of the domestic banks. Future studies could investigate at which point the domestic banks would no longer benefit from continuous increase in the entry foreign banks into the Ghanaian banking sector.

Moreover, a positive relationship with efficiency was found for determinants such as the ROA (profitability) and inflation. Also, a negative relationship was established for the bank capitalisation ratio, liquidity ratio, and HHI. The significance of bank capitalisation ratio as a determinant of technical efficiency implies that banks with higher capital adequacy ratio are less efficient since they are risk-averse and prefer safer and lower-earning portfolios whilst the opposite holds true for the more efficient banks.

5.3 Recommendations

Considering the empirical results from the study it is important for Governments and policy makers to make policies that would continue to allow competition within the banking industry because competition would promote higher efficiency of the domestic banks. It must be mentioned that opening up the banking sector to foreign banks enables the domestic banks to be more technically efficient. The researcher at this point does not have sufficient empirical evidence to tell when there would be a break-even point or when additional addition of foreign banks would result in diminishing returns to the
domestic banks. Testing for such a point could be an interesting area worthy of future research. Also, it is recommended that government must reduce corporate tax, give tax holidays, etc. as incentives to encourage efficiency within the banking industry. This is recommended because profitability, which is also a significant determinant of bank technical efficiency, can be seriously affected by high corporate taxes and vice versa.

Form our regression results, we find that profitability has a positive and statistically significant relationship with technical efficiency. The researcher therefore recommend for the individual banks/bank managers and bank owners to endeavour to improve business profitability through cost/expenditure minimisation (especially avoid and reduce waste in the bank) and/or revenue maximization. They may look at outsourcing the non core functions of the banks in order to help them focus more on their core functions/objectives and reduce risk. In addition, they can look at, for example, renting a business premises instead of putting up huge branches that might not be so profitable. They may also watch income leakages in their operations, put in strong internal control systems/operations manuals so as to encourage more profit and reduce fraud and income leakages. Banks must watch their liquidity position since liquidity problems can create issues such as sanctions and other huge financial fines/charges from BoG for the bank in question not meeting its prudential requirements. In such a case also, the bank may have to source for more liquidity at high costs in order to augment its liquidity position, etc. Responding to the findings of this study the banks in Ghana must upgrade the quality of their management practices, especially as technical efficiency as to do with management decision. The bank should pursue service production/delivery orientation strategies which increase outputs and/or decrease inputs consumption.

From the overall technical efficiency ranking the banks must adopt a benchmark management system in order to continually evaluate their position relative to other industry players, especially the most technically efficient banks, and subsequently adopt appropriate changes for catching up with the best performing bank (“best practices”) if need be. To this extent, the banks must constantly undertake market intelligence survey, environmental scanning, etc.
References:


Anim, T. E., 2000, Banking in Ghana, Accra, Woeli Publishing Services)


Fethi, M.D., Jackson, P.M. & Weyman-Jones, T. G., 2000, “Measuring the Efficiency of


Jackson, P. M. and Fethi, M. D., 2000, “Evaluating the technical efficiency of Turkish commercial banks: An Application of DEA and Tobit Analysis, International DEA Symposium, University of Queensland, Brisbane, Australia, 2-4 July, 2000

Kablan, S., 2007, “Measuring Bank Efficiency in Developing Countries: The Case of WAEMU (West African Economic Monetary Union)”


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Liikanen, Erkki, Governor of the Bank of Finland; speech at the European Productivity Conference, Espoo, 30 August 2006.


Republic of Ghana, Banking Law, 1989 (PNDCL 225)


## Appendix 1: Banks used in the sample

<table>
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<tr>
<th>BANK</th>
<th>FULL NAME</th>
<th>STATUS</th>
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<tbody>
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<td>BBG</td>
<td>Barclays Bank Ghana Ltd.</td>
<td>FOREIGN</td>
</tr>
<tr>
<td>EBG</td>
<td>Ecobank Ghana Ltd.</td>
<td>FOREIGN</td>
</tr>
<tr>
<td>SCB</td>
<td>Standard Chartered Bank Ghana Ltd.</td>
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<td>SG-SSB</td>
<td>SG-SSB Bank Ghana Ltd.</td>
<td>FOREIGN</td>
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<tr>
<td>SBL</td>
<td>Stanbic Bank Ghana Ltd.</td>
<td>FOREIGN</td>
</tr>
<tr>
<td>ZBL</td>
<td>Zenith Bank (Ghana) Ltd.</td>
<td>FOREIGN</td>
</tr>
<tr>
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<td>Intercontinental Bank (Ghana) Ltd.</td>
<td>FOREIGN</td>
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<td>International Bank Ghana Ltd.</td>
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</tr>
<tr>
<td>GTB</td>
<td>Guaranty Trust (Ghana) Ltd.</td>
<td>FOREIGN</td>
</tr>
<tr>
<td>UBA</td>
<td>United Bank for Africa (Ghana) Ltd.</td>
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<td>ABL</td>
<td>Amalgamated Bank Ghana Ltd.</td>
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<td>Ghana Commercial Bank Ghana Ltd.</td>
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<tr>
<td>UTB</td>
<td>UT Bank Ghana Ltd.</td>
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Market Share Analysis: Domestic Banks vs. Foreign Banks

The graphs below show the respective market shares for foreign banks as well as domestic banks from 2000 to 2008.

Appendix 2: Loan/Advances Distribution

Appendix 3: Total Assets
Appendix 4: Deposits

Appendix 5: Stated Capital