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碩士論文

越南銀行效率分析-
以越南投資發展銀行 (BIDV) 為例

Examining the efficiency of Vietnamese banks- The case of Bank for
Development and Investment of Vietnam (BIDV)

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CHINESE ABSTRACT

近年來，越南的金融機構在跨境的規模上已經歷了一個充滿活力，快節奏，競爭激烈的環境。其中增長最快的是銀行等行業。越南迅速轉化從壓抑的銀行體系開始放鬆管制，開放邊界，新的銀行牌照的發放並私有化。自 2007 年 1 月加入世貿組織，越南銀行業監管已經越來越被關注。在一個更具競爭力的銀行體系，希望增加其效率，以加強其地位。

本文所提供的方法將試圖以領先越南銀行的效率進行分析—2007 至 2011 年 BIDV。BIDV 的案例下為兩款車型提供適當的概述，CAMEL 和 DEA。在銀行危機在世界各地近年來，CAMEL 是一種有用的工具來檢查安全和穩健的銀行，並幫助減輕潛在的風險可能會導致銀行倒閉的危機。不僅對 CAMEL，DEA 也是一個很好的工具去評估銀行的效率。本論文的主旨在從 CAMEL 和 DEA 的架構下在銀行業監管中皆可發揮關鍵作用。

這資金可以幫助銀行家和一些從事銀行和金融部門相關工作的人去決定如何提高銀行的效率。



ENGLISH ABSTRACT

In recent years, financial institutions in Vietnam have experienced a dynamic, fast-paced, and competitive environment at a cross-border scale. One of the fastest growing industries is banking. Vietnam transformed rapidly its repressed banking system with deregulation, the opening of borders, the granting of new banking licenses, and privatization. Since accession to WTO in January, 2007, Vietnamese banking supervision has been increasingly concerned. In a more competitive banking system, one would expect an increase in its efficiency to enhance its position.

This thesis attempts to apply methods in order to analyze efficiency of a leading Vietnamese bank – BIDV over the years from 2007 to 2011. The case of BIDV provides overview of two proper models, CAMEL and DEA. In the light of the banking crisis in recent years worldwide, CAMEL is a useful tool to examine the safety and soundness of banks, and help mitigate the potential risks which may lead to bank failures. Not only CAMEL, DEA is also a good instrument to assess the efficiency of banks. The thesis aims to determine whether the CAMEL framework and DEA play crucial roles in banking supervision.

The findings can help bankers and some people who are working in banking sector particularly and financial institutions generally decide how to improve the efficiency of their banks.

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I. INTRODUCTION

This chapter presents an overview of research, including background of study, research objectives, and research questions as well as the structure of the thesis.

1.1. BACKGROUND

Vietnam is a noticeable Southeast-Asian country with its population of 85 million, strategic geographical position in one of the world's most economically dynamic regions, high economic growth, stable political environment, and low labor and material costs. Especially the shift from a centrally planned economy to a market economy since 1986 is viewed as a turning point of Vietnam because it has totally changed the structure of Vietnam economy and brought positively tremendous impacts to various aspects of the country.

In addition, after its accession to WTO in January 2007, Vietnam has witnessed surprising economic development with highest growth rates in the history. As a result of this entering and the obligation arising from the bilateral trade agreement, the government of Vietnam realized the compelling need to reform the economy. Vietnam has unceasingly made attempt to open up more sectors to foreign investors and promote the private sector. In the coming years, Vietnam plans to gain dramatic pace of growth around 10% and enhances its position as an undeveloped country in the map of international economies. The willingness to change, along with the amendment of national policies, has improved noticeably regime and business environment of this non-state sector. And one of the sections in Vietnam exposed to rapid change is banking field. The Vietnam banking sector acts as the life blood of Vietnam economy and commerce to provide them with a major source of finance.

The Vietnam banking history altered since a comprehensive reform program named “Doi moi” was launched in December 1986. Before that time point, during the first years of 1980s, the structure of the Vietnamese banking system relied upon a one-tier model typical of entirely administered banking systems in socialist economies. In such a model, the central bank is the sole bank in the country. After 1986, it was vastly reformed into a two-tier model, the central bank now dedicated to missions of regulation of the financial sector and second-tier banks (or commercial banks) in charge of sector allocation and credit volume decisions.

As this two-tier system emerged, five State owned commercial banks (SOCB), around forty-five joint-stock banks (JSB), partially owned by private investors, and many People's Credit Funds were created. Four of the five SOCBs largely dominate the market (Vietcombank, Vietinbank, Bank for Investment and Development of Vietnam, and the Bank for Agriculture and Rural Development).

The emergence of a two-tier system was not the only illustration of the improvement of banking system in Vietnam. The liberalization of interest rates, the growing share of private capital and the will to develop financial markets are also three main driving forces of the development of financial environment. Besides, banking system in Vietnam has substantially reorganized over two past decades, including introduction of both foreign and market banks, and a marked diversification, following a rapid expansion in the scale of business.

However like other industries, Vietnam banking system has still faced many challenges, especially, the most serious threat is losing more business to foreign competitors or financial institutions. With the purpose to improve banks' management standards and the quality of competitiveness, Vietnam banks are recently considering strategies to improve consistently their performance in currently strict market. And enhancing the efficiency of bank is one of the most crucial ways that most Vietnam Banks are following in order to achieve this goal.

1.2. OBJECTIVES

When the study was started, the method to assess the bank's efficiency is quite complicated in Vietnam since there are different ways to approach to it. In Vietnam banking system research, there has apparently been very few empirical study of this problem and this thesis is trying to fill that lack. In addition, this research aims to investigate deeply about Bank for Investment and Development of Vietnam (BIDV) not only for enhancing BIDV but also for developing general Vietnam banks. Through the case of BIDV, other bank managers and bankers could find some clear strategies for improving its own efficiency also. Thus, the major objectives of this thesis are:

- To obtain an overview of methods to assess the efficiency of banks: by using CAMEL (capital adequacy, quality of assets, management quality, earnings quality, and liquidity); and applying Data Envelopment Analysis (DEA) methods.

- To gain a better understanding of a Vietnamese bank – BIDV bank and to examine the efficiency of the Vietnam bank relative to Taiwan banking sector.
- To provide recommendations on how to improve banking efficiency.

I expect the result of this research and the subsequent suggestions to be interested and relevant to: board member and members of top management in banks, trainers, researchers in banking sector.

1.3. RESEARCH QUESTIONS

Question 1: How to examine efficiency in bank?

Question 2: Comparison between BIDV and Taiwanese banks?

Question 3: What are recommendations to Vietnamese banks for improving efficiency?

1.4. THE RESEARCH STRUCTURE

The thesis is organized in 5 chapters.

Chapter I: is the introduction.

Chapter II: deal with the Literature Review and Theoretical Theories for research which will be discussed in the chapter III and chapter IV.

Chapter III: reveals choices about what information and data to gather and choices about how to analyze the information and data that gathered. This chapter mentions deeply about Data Envelopment Analysis (DEA) method because it is used for the estimation of production frontiers of banks' efficiency.

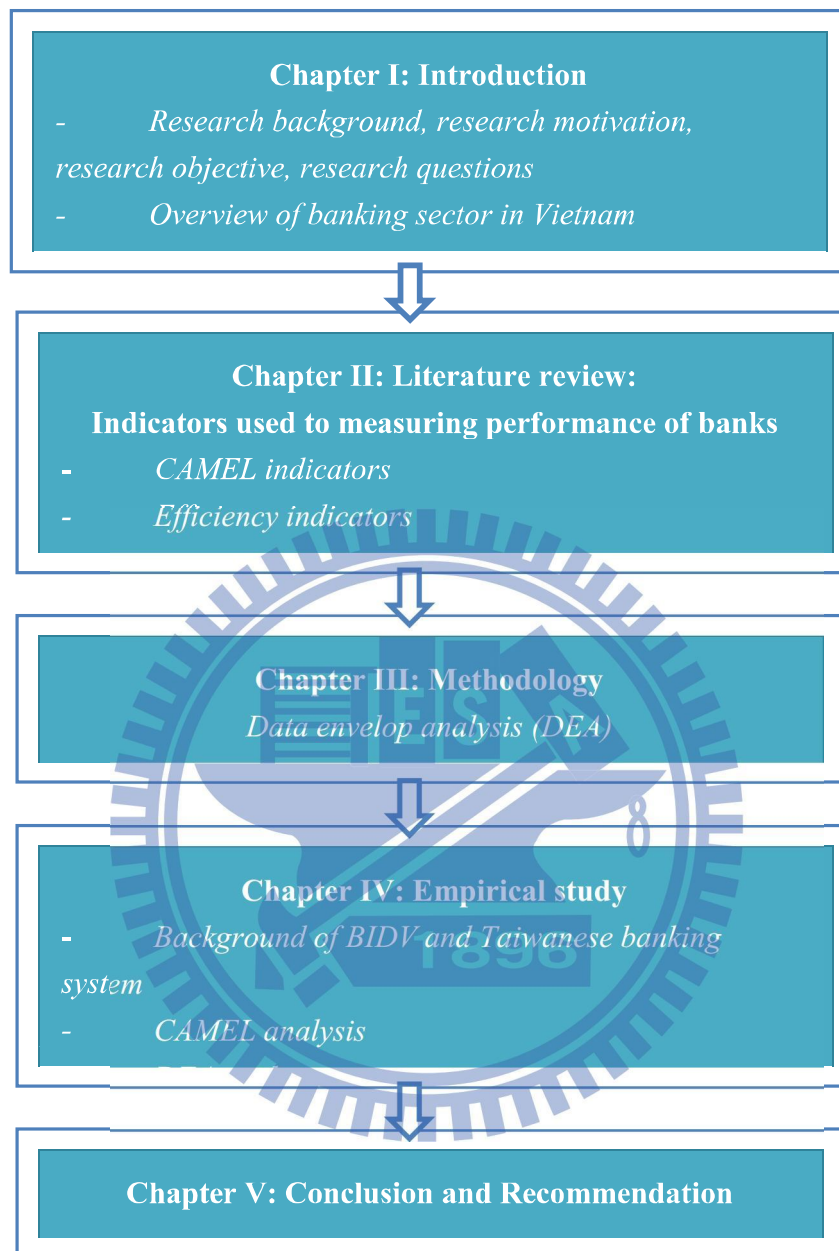


Figure 1: Research Structure

Chapter IV: uses CAMEL model to analyze the sources of efficiency of BIDV. It includes a study of the influencing factors such as Capital Adequacy, Asset Quality, Management, Earnings and Liquidity in order to identify their impacts on bank's profitability. Furthermore, in order to work out the critical business issues of the banking sectors. This provides a general overview of the profit situation, and the challenges the country and, more

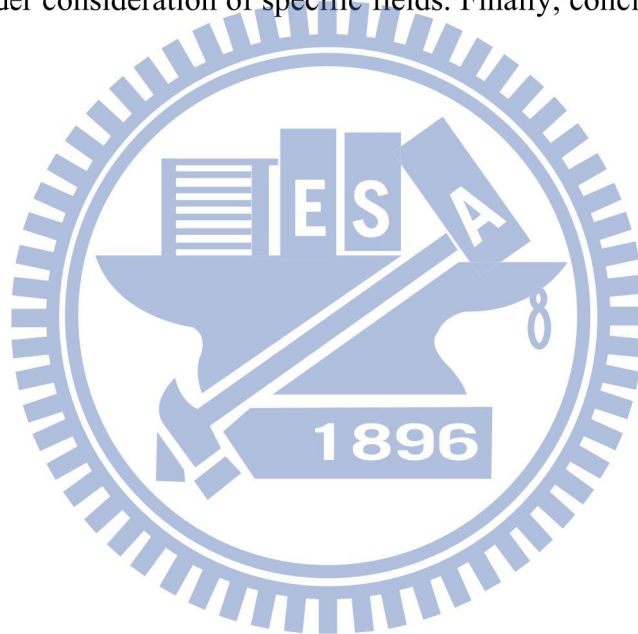
specifically, the banking sector in Vietnam faces.

This chapter also measures the efficiency of BIDV by comparing to Taiwanese banks, using the DEA methods.

The results of this chapter serve as basis information for giving recommendations and suggestions which are discussed in Chapter V.

Chapter V: aims to find out how to examine efficiency in Vietnamese banks in order to give recommendations on how to improve the bank's performance with the highest efficiency.

Chapter V also provides suggestions about how banking managers and bankers could tackle challenges in efficient problems. This is based on the analysis of the current status and the future situation under consideration of specific fields. Finally, conclusion for the whole thesis is given.



II. LITERATURE REVIEW

In this chapter of thesis, the theoretical basis is built for the research which will be deeply discussed in the Chapter III and Chapter IV. In addition, the definitions and parameters for examining efficiency of banks will also be reviewed and clearly explained. Since CAMEL model is the leading important measure of banking supervisory tool, this section will mostly focus on CAMEL.

2.1. BANKING EFFICIENCY

There are many papers belonging to the bank efficiency literature. According to the international survey of Berger and Humphrey (1997), bank efficiency studies can contribute to government policy, research, and bank management. This paper contributes to government policy with an empirical evaluation of the impact of deregulation and the granting of new banking licenses on the efficiency of a banking system.

In Berger and Humphrey's study, the authors observe that the conventional wisdom that holds that deregulation improves efficiency is not always validated by empirical studies. For instance, the banking efficiency in the US was relatively unchanged by deregulation in the early 1980s (Elyasiani and Mehdi, 1995), while banks of Norway and Australia experienced improved efficiency after deregulation (Berg et al., 1992; Avkiran, 1999). This paper shows that the rapid deregulation in Portugal has been accompanied by a major increase in the efficiency of banks over the period 1990–1995. Moreover, a limited series of papers in the government policy literature have analyzed the performance of new (de novo) commercial banks in terms of rate of bank failures, portfolio structure, or profitability (for instance, DeYoung and Hasan, 1998).

2.2. CAMEL FRAMEWORK

CAMEL is the abbreviation of five measuring scales of the financial institution: Capital adequacy, Asset quality, Management quality, Earning ability and Liquidity. First of all CAMEL was made for fortification of the North - American bank arranger to also measure the financial and managerial health of the American loan and trade institutions using the key ratios, indexes and organizational solutions and methods¹. After that, the Basle Committee

on Banking Supervision of the Bank of International Settlements (BIS) has recommended using CAMEL as criteria for assessing a Financial Institutions in 1988 (ADB 2002). The sixth component, market risk (S) was added to CAMEL in 1997 (Gilbert, Meyer and Vaughan 2000). However, most of the developing countries are using CAMEL instead of CAMELS in the performance evaluation of the Financial Institutions. The central banks in some of the countries like Nepal, Kenya use CAEL instead of CAMELS.

Barr and his colleagues (2002) state that “CAMEL rating has become a concise and indispensable tool for examiners and regulators”. This rating ensures a bank’s healthy conditions by reviewing different aspects of a bank based on variety of information sources such as financial statement, funding sources, macroeconomic data, budget and cash flow. Nevertheless, Hirtle and Lopez (1999) stress that the bank’s CAMEL rating is highly confidential, and only exposed to the bank’s senior management for the purpose of projecting the business strategies, and to appropriate supervisory staff.

2.2.1. Capital Adequacy

Capital adequacy is a reflection of the inner strength of a bank, which would stand it in good stead during the times of crisis. Capital adequacy may have a bearing on the overall performance of a bank, like opening of new branches, fresh lending in high risk but profitable areas, manpower recruitment and diversification of business through subsidiaries or through specially designated branches.

Karlyn (1984) defines the capital adequacy in term of capital-deposit ratio because the primary risk is depository risk derived from the sudden and considerably large scale of deposit withdrawals.

The adequacy of capital is examined based upon the two most important measures such as Capital Adequacy Ratio (CAR) and the ratio of capital to assets. The computation of capital adequacy ratio is done by taking ratio of equity capital and loan loss provisions minus non-performing loans to total assets. Expressed as a percentage, the ratio shows the ability of a bank to withstand losses in the value of its assets (Joshi & Joshi, 2002). For computation of

the capital adequacy ratio, capital is classified as Tier-1 and Tier-2 capitals. Tier-1 capital comprises the equity capital and free reserves, while Tier-2 capital comprises subordinated debt of 5-7 year tenure. The higher the capital adequacy ratio (CAR) is, the stronger the bank is. However, a very high CAR indicates that the bank is conservative and has not utilized the full potential of its capital.

This capital ratio is required to meet a minimum of 8% set by the Bank for International Settlement (BIS). However, it is important to note that in some countries the required minimum capital may vary depending on the local regulators; and the bank might like to have as high a capital ratio as possible.

2.2.2. Asset Quality

Asset quality is another important aspect of the evaluation of a bank's performance. We can use a number of measures to indicate the quality of assets held by banks. ADB suggests these measures - loan concentration by industry, region, borrower and portfolio quality; related party policies and exposure on outstanding loan, approval process of loan, check and balance of loans; loan loss provision ratio; portfolio in arrear; loan loss ratio; and reserve ratio - of checking the quality of assets of a Financial Institutions (ADB).

Frost (2004) stresses that the asset quality indicators highlight the use of nonperforming loans ratios (NPLs) which are the proxy of asset quality, and the allowance or provision to loan losses reserve. As defined in usual classification system, loans include five categories: standard, special mention, substandard, doubtful and loss. NPLs are regarded as the three lowest categories which are past due or for which interest has not been paid for international norm of 90 days. In some countries regulators allow a longer period, typically 180 days. The bank is regulated to back up the bad debts by providing adequate provisions to the loan loss reserve account.

2.2.3. Management Quality

Management quality is basically the capability of the board of directors and management, to

identify, measure, and control the risks of an institution's activities and to ensure the safe, sound, and efficient operation in compliance with applicable laws and regulations (Uniform Financial Institutions Rating System 1997).

Sound management is the key to bank performance but is difficult to measure. The quality of Management capacity is usually qualitative and can be understood through the subjective evaluation of Management systems, organization culture, control mechanisms and so on. However, the capacity of the management of a bank can also be gauged with the help of certain ratios of off-site evaluation of a bank such as earnings per employee, credit deposit ratio and others.

Grier (2007) suggests that management is considered to be the single most important element in the CAMEL rating system because it plays a substantial role in a bank's success; however, it is subject to measure as the asset quality examination.

2.2.4. Earnings Ability

Earning capacity keeps up the sound health of a bank. There are different indicators of earning capacity, including Return on assets, return on equity, interest-spread ratio, earning-spread ratio, gross margin, net profit margin. Higher indicators generally reflect a lack of financial difficulties and so would be expected to reduce the likelihood of failure of a bank (Cole and Gunther, 1996).

In accordance with Grier (2007)'s opinion, a consistent profit not only builds the public confidence in the bank but absorbs loan losses and provides sufficient provisions. It is also necessary for a balanced financial structure and helps provide shareholder reward.

Thus consistently healthy earnings are essential to the sustainability of banking institutions. Profitability ratios measure the ability of a company to generate profits from revenue and assets.

2.2.5. Liquidity

Liquidity could threaten the solvency of banks. There are two main types of liquidity risks; the first is that when depositors want to withdraw their money and the second is that when

commitment holders need to exercise the commitments recorded off the balance sheet.

The ability of a bank to provide liquidity requires the existence of a highly liquid and readily transferable stock of financial assets. Liquidity and transferability are the key ingredients for such transactions. The liquidity requirement means that financial assets must be available to owners on short notice (a day or less) at par. The transferability requirement means that ownership rights in financial assets must be portable, at par, to other agents, and in a form acceptable to the other parts.

2.3. APPLICATION OF DATA ENVELOPMENT ANALYSIS FOR BANKS

Data Envelopment Analysis (DEA) is a method for measuring the relative efficiencies of a set of comparable units such as banks, bank branches, schools, hospitals and similar institutions whose common feature is the ability for their activities to be described as the conversion of certain inputs into various forms of output. The basic concept in efficiency measurement with such entities is the relation of their output and input ratios. The concept is formalized in the following linear programming model, introduced by Charnes, Cooper and Rhodes in their paper (Charnes, Cooper and Rhodes, 1978).

While there has been a large number of studies focusing on the efficiency features of banking sector, particularly the papers on US and European banking markets and similarly in rest of world but only a few works on Asian banking are done. However, this trend is changing and more and more researchers examine the efficiency of Asian banks.

Ana Canhoto, and Jean Dermine (2000) investigate the efficiency of Portuguese banks for the period of (1990-1995). They used non-parametric programming technique , Data Envelopment Analysis (DEA) model to estimate efficiency of 20 Banks which were divided in to segments of Old Commercial banks , Old savings banks and New banks. The result shows an improvement in efficiency for the overall sample over time of the order of 59% over the years 1990–1995. The new banks dominate the old ones in terms of efficiency with an average efficiency score of 77% compared to 62%. In addition, the creation of new banks is likely to accelerate the efficiency gains expected from a period of deregulation, hence, not hampered by the past, new banks should choose the best production techniques, increase competition, and put restructuring pressures on incumbents.

Donsyah Yudistira (2003) investigates the efficiency performance of 18 Islamic banks over

the period of (1997-2000). He used non-parametric programming technique, Data Envelopment Analysis (DEA) model to estimate efficiency of 18 Islamic Banks for period (1997-2000). The overall efficiency results suggest that inefficiency across 18 Islamic banks is small at just over 10 percent, which is quite low compared to many conventional counterparts. Similarly, Islamic banks in the sample suffered from the global crisis in 1998-1999 but performed very well after the difficult periods. This would illustrate that the interdependence of Islamic banks on other financial system is significant and any regulator, especially in which the bank operates, should consider Islamic banking in the search of global financial stability. Lastly, the findings further indicate that there are diseconomies of scale for small-to-medium Islamic banks which suggests that M&A should be encouraged.

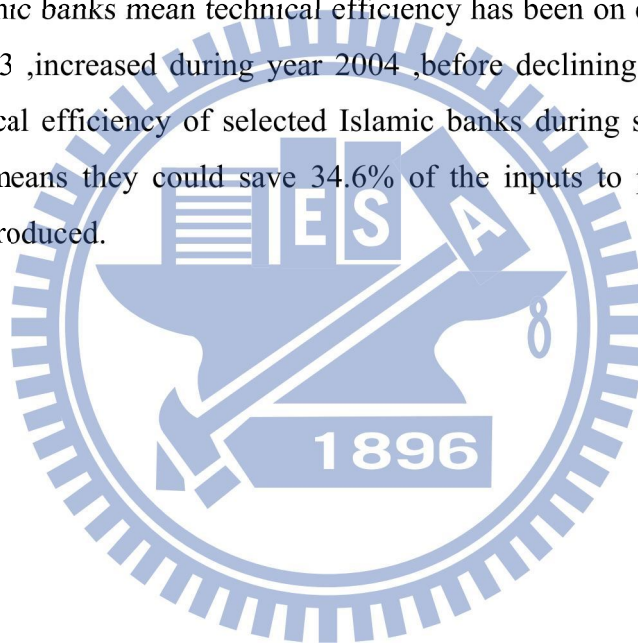
Abdul Qayyum (2007) investigates the yearly efficiency scores of 20 banks for period of (1991-2005). He used non-parametric programming technique, Data Envelopment Analysis (DEA) model to estimate efficiency of 20 Banks for period (1991-2005). The results indicates that efficiency score of banking improves from 65% in 1991 to 87.6% in 2005. As a result of which banks are able to expand their core business activities, they strengthened their capital base, improved asset quality and profitability during the year 2005. These developments clearly reflect the increased competition among banks and improvement in efficiency of banking sector.

Elana Loukoianova (2008) investigate efficiency and profitability of Japanese banks from (2000-2006). She used non-parametric programming technique, Data Envelopment Analysis (DEA) model to estimate efficiency and profitability of city Banks, Trust Banks, Regional Banks and Tier II regional banks of Japanese Banks for (2000-2006). The DEA results could point to potential efficiency gains, particularly for regional banks, arising from cost-sharing arrangements. Groups of regional banks have already been taking steps to reduce costs by sharing computer systems, pooling risk management, and joint outsourcing, and should be encouraged to increase their involvement in such arrangements.

Kamaruddin et al (2008) investigates new perspectives on performance evaluation of Islamic Banking operations in Malaysia by measuring both cost and profit efficiency of full-fledged Islamic banks and Islamic windows operations of domestic and foreign banks. They used non-parametric programming technique, Data Envelopment Analysis (DEA) model to

estimate both cost and profit efficiency of 2 Islamic banks and 12 Islamic Windows Divisions for the period of (1998-2004).The results indicates that overall cost efficiency estimate is 0.695 , which is within range of scores found in other overseas studies, such as 55% in UK, it is far from satisfactory level since it suggests that an Islamic bank wastes around 30.5%of its inputs relative to best –practice bank.

Sufian et al (2008) investigates the efficiency of the Islamic banking sectors in 16 MENA and Asian countries during the period of (2001-2006). They used non-parametric programming technique, Data Envelopment Analysis (DEA) model to estimate efficiencies of 37 individual Islamic banks of 16 MENA and Asian countries for the period of (2001-2006).The results indicates that Islamic banks mean technical efficiency has been on declining trend during the years 2001 to 2003 ,increased during year 2004 ,before declining again in years 2005 and 2006.Mean technical efficiency of selected Islamic banks during sample years were 65.4% which indirectly means they could save 34.6% of the inputs to produce same amount of outputs that they produced.



III. METHODOLOGY

Methodology describes the research route to be followed, the instruments to be used universe and sample of the study for the data to be collected, the tools of analysis used and pattern of deducing conclusions. For the objectives of this thesis, the research instruments used are the CAMEL and DEA models which are the recent innovations and efficient tools in the area of financial performance and efficiency evaluation of banks.

3.1. CAMEL method

3.1.1. Parameters of CAMEL model

As mentioned in the previous chapter, CAMEL is a common evaluating system of individual banks along with five key parameters-Capital adequacy, Asset quality, Management capability, Earnings capacity, and Liquidity. Those five parameters are variables and I based on them to assess the performance of selected bank.

3.1.2. Sample of research

Sample of research is a leading bank of Vietnam, BIDV – Bank for Investment and Development. The CAMEL model will be applied in BIDV in order to analyze the performance of this bank.

With the aim of making this research more comprehensive then I used both primary and secondary sources for collection of relevant data and required information. This data was collected from the following sources:

- Annual and quarterly financial statements of BIDV
- Database of the State Bank of Vietnam.
- Quarterly Brochures of the State Bank of Vietnam
- Leading Vietnamese English Newspapers.
- Different Research Journals.
- Books on Banking and Finance.

3.2. DATA ENVELOPMENT ANALYSIS

3.2.1. Introduction of DEA method

DEA is a linear programming model that measures the relative efficiency of decision-making units (DMUs) with multiple inputs and outputs without production function. The results of DEA determine Pareto Frontier which is attained and marked by specific DMUs on the boundary envelope of input/output variable space if DMU lie on the envelope than efficient otherwise inefficient.¹ In other words, all DMUs with the best efficiency can constitute a frontier of efficiency and the DMUs with relative low efficiency are below the frontier.

Instead of using fixed weights for all DMUs under evaluation, DEA computes a separate set of weights for each DMU. Each DMU will choose weights so as to maximize self-efficiency with the constraints that the efficiency of no DMU exceeds 1 when using the same weights. DEA also provide reasons for inefficiency by comparing inefficient units with the peer group of efficient units. It also sets target levels for the inefficient units to become efficient one.

The first DEA model that successfully optimized each individual observation was CCR proposed by Charnes, Cooper and Rhodes (1978) and was based on the previous work of Farrell (1957) named Technical Efficiency (TE). After that this model has been improved and gradually used widely in many various aspects, from socio-economic sectors and public services to private firms.

3.2.2. Stages of an applied research using DEA

There are five stages in establishing process of research using DEA method as below:

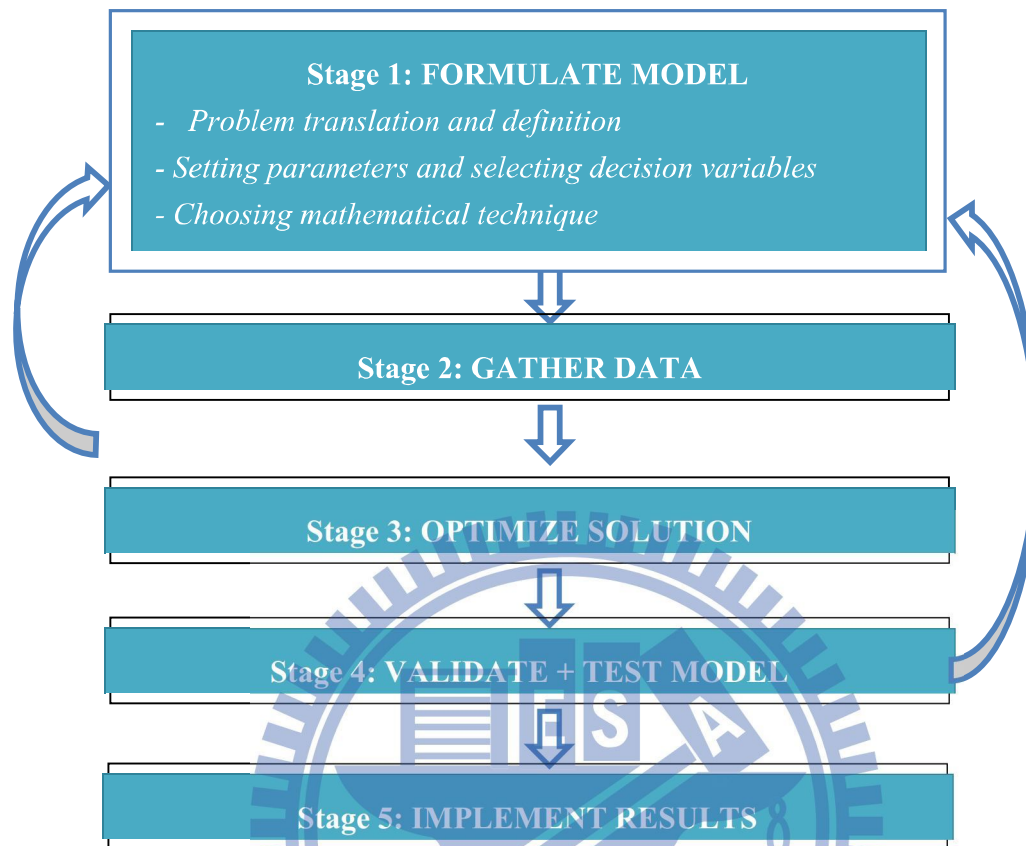


Figure 2: Stages of an applied research using DEA

Stage 1 comprises three steps: problem translation and definition, setting parameters and selecting variables, choosing mathematical technique. This stage is focusing on refining and defining parameters, selecting important variables and forming the formulations. It also includes the establishment of relationship between parameters and variables as well as dividing independent variables, dependent variables and inputs, outputs.

Stage 2 is to gather data necessary for DEA computation. Data collected will relate to parameters mentioned in stage 1. This stage is sometimes considered as the most time-consuming and costly step during the total process.

Stage 3 is to optimize solution. After collecting carefully, all data information will be entered into the model with the aim that the optimum solution will be calculated.

Stage 4 is to validate and test model. This stage is very important since model validation is to justify the mathematical interpretation of reality and testing of the DEA through trial experiments is to run the program for the optimal solution. When testing is complete and the

model has been validated, the implementation stage can commence.

Stage 5 is result implementation. This is also the last step and gives the outcome of total process.

3.2.3. Basic models of DEA

The CCR efficiency evaluation model (1978) assumes production technique of each DMU has constant returns to scale. It can deduce a frontier of efficiency and calculate the relative efficiency of each DMU by analyzing the input. The DMU which falls on the frontier of efficiency is called DEA efficiency and the value of it is 1. While DMU which does not fall on the frontier of efficiency is called DEA inefficiency and the value of it is between 0 and 1. CCR finds the efficiency of DMUs' operating in multiple input-output environments:

$$\max h_0 = \frac{\sum_{r=1}^s u_r y_{r0}}{\sum_{i=1}^m v_i x_{i0}} ; \text{ s.t. } \frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1, \quad u_r, v_i > 0, \quad j = 1..n, \quad (1)$$

where: x_{ij} represents the amount of input i utilized by DMU $_j$, while $y_{rj} > 0$ represents the amount of output r produced by DMU $_j$; v_i is the weight given to output i , and u_r is the weight given to input r . The optimal solution $h_0^* = \max h_0$ will always satisfy $0 \leq h_0^* \leq 1$. For solving Problem (1) we use linear programming with the following formulation:

$$\begin{aligned} \max \quad & z_0 = \sum_{r=1}^s u_r y_{r0} \\ \text{s.t.} \quad & \sum_{i=1}^m v_i x_{i0} = 1, \quad \sum_{r=1}^s u_r y_{rj} - \sum_{i=1}^m v_i x_{ij} \leq 0 \\ & j = 1, \dots, n, \quad u_r, v_i \geq \epsilon, \quad \forall r, i. \end{aligned} \quad (2)$$

It is often the case that some environmental parameters are uncontrollable, so there is the need to extend (1) to account for uncontrollable inputs according to Banker and Morey (1986):

$$\begin{aligned}
\max \quad & \theta_0 = \frac{\sum_{j=1}^s w_j y_{j0} - \sum_{k=1}^t u_k z_{k0}}{\sum_{i=1}^r v_i x_{i0}} \\
\text{s.t.} \quad & 1 \geq \frac{\sum_{j=1}^s w_j y_{jm} - \sum_{k=1}^t u_k z_{km}}{\sum_{i=1}^r v_i x_{im}}, \quad m = 1, \dots, n, \\
& w_j > 0, \quad j = 1, \dots, s, \\
& v_i > 0, \quad i = 1, \dots, r \quad (\text{weights for controllable inputs}), \\
& u_k > 0, \quad k = 1, \dots, t \quad (\text{weights for uncontrollable inputs}).
\end{aligned} \tag{3}$$

The CCR model is limited to the following restrictions: constant returns to scales (CRS), and the convexity of the production possibility set. However, the CRS assumption is only appropriate when all DMUs are operating at an optimal scale. When all DMUs are not operating at optimal scale, the use of the CRS specification results in that measures of technical efficiency are confounded by scale efficiencies. Banker et al. (1984) suggested an extension of CRS CCR model to account for variable returns to scale (VRS) situations.

$$\theta_{CRS} = SE \times \theta_{VRS}$$

Where: θ_{CRS} = technical efficiency

θ_{VRS} = pure technical efficiency

There are many reasons behind using DEA method. The main one is to identify the sources and the extent of relative inefficiency in each of the compared DMUs. Brockett and Golany (1996) introduced a new approach that analyzes data by groups rather than by individual DMUs. If the DMUs are grouped by their operational characteristics, their approach can assist management in evaluating what should be the best policy from the available options doing the following (originally k=2):

1. Split the group of all DMUs ($j = 1, \dots, n$) into k programs consisting of n_1, \dots, n_k DMUs ($n_1 + n_2 + \dots + n_k = n$). Run DEA
2. In each of the k groups separately, adjust inefficient DMUs to their “level of efficiency” value by projecting each inefficient DMU onto the efficiency frontier of its group
3. Run a pooled (or “inter-enveloped”) DEA with all the n DMUs at their adjusted efficient level.

4. Apply a statistical test to the results of III to determine if the k groups have the same distribution of efficiency values within the pooled DEA set (or does it vary according to different uncontrollable parameters).

3.2.4. Advantages and Limitations of DEA method

It could be apparently seen that the development of DEA over the past time has demonstrated its acceptance not only as an effective diagnostic tool but also as a valuable addition to measuring efficiencies and efficiency-like relationships in a variety of commercial environments. Specifically, this method is a powerful non-parametric instrument for analyzing efficiencies of DMUs in the same cohort by allowing direct peer and peer to grouped-peers comparisons, based on a multitude of input and output factors through a diverse range of models.

Charnes et al. (1994) provide twelve strengths of DEA as listed below:

- 1) The focus is on individual DMUs in contrast to population averages.
- 2) Each DMU has a single aggregate measure for the utilization of input factors (independent variables) to produce desired outputs (dependent variables).
- 3) DEA can simultaneously utilize multiple outputs and multiple inputs with each being stated in different units of measurement.
- 4) Adjustments can be made for extraneous variables.
- 5) Categorical (dummy) variables can be included.
- 6) Computations are value-free and do not require specification or knowledge of a priori weights of prices for the inputs or outputs.
- 7) There is no restriction on the functional form of the production relationship.
- 8) DEA can accommodate judgment when desired.
- 9) DEA can produce specific estimates for desired changes in inputs and/or outputs for projecting DMUs below the efficient frontier onto the efficient frontier.

However, DEA method still remains some weaknesses compared to other methods. The same characteristics that make DEA a powerful tool can also create problems:

- 1) The non-parametric nature of DEA means it does not allow the application of inferential statistics and traditional mechanisms such as hypothesis testing, etc.

2) It is poor with absolute values although very efficient with relative efficiencies. In other words, it can tell you how well you are doing compared to your peers but not compared to a "theoretical maximum."

3) DEA appears to be lack of definitive operational parameters.

3.2.5. Application of DEA method on banking efficiency research

DEA is a method which has high applicable value in operational research, management science and mathematical economics. It is well used in complex system with multi-input and multi-output index. Especially, DEA has its strength of mathematical sophistication and the maturity demonstrated by its commercial availability. Hence, DEA is judged as the most suitable means of measuring performance, as defined by the productivity paradigm. In addition, is also seen as the most adept at achieving the measurement requirements for evaluating performance of economy, technology and social issues.

For more details, DEA has many advantageous traits as following:

- It could not give wrong conclusion by using the inappropriate model since it does not need to constitute a frontier for concrete function like parameter method.
- The DEA method needs not to determine the comparability of each index in advance as the index of complex system is hard to compare.
- The unit standardization of input and output items, such as currency units, number of employees and times of transaction, is unnecessary for DEA.
- DEA method needs not to determine the weight of input/output index in advance. It utilizes the weight of each input/output (DMUs) as variable to evaluate from the aspect most suitable to DMUs. As a result, it can exclude many subjective factors and has high objectivity.
- The relation among each input/output (DMUs) is quite complex. But the DEA method can measure the quantitative index of each DMU's comprehensive efficiency without determining the explicit relation among them. It can determine the efficient DMUs and analyze the cause of inefficiency so as to adjust the direction and extent of input (DMUs).

With good characteristics of DEA as above, it is absolutely good instrument for measuring the banking efficiency. First, the relative efficiency is a good index to measure banks' performance in competitive market and it is also a potential signal which can determine

whether a bank is failure or not. Second, efficiency index can also be used to evaluate the effectiveness of supervision and market environment on bank's performance. Lastly, this mathematics method will help the bank to find the cause of low efficiency. Therefore, banks can amend their strategies to promote the relative position in banking systems.

In application of DEA for banks, this method uses observed values of inputs and outputs and attempts to find which of the banks in the given sample determine an envelopment analysis. In DEA most efficient bank (with the score of 1) doesn't necessarily generate maximum output level but it does indicate that it has tendency of generating best practice outputs among the rest of firms in the given sample. Firms lying on the surface of are deemed to be the efficient and receive value of unity whereas; firms falling below surface level are deemed as inefficient and capture the value less than unity. Hence, all deviations from the estimated frontier represent inefficiency.

The DEA model allows for the treatment of constant as well as variable returns to scale. The constant return to the scale (CRS) is advantageous as it allows for comparison between small and larger banks in a situation where frequency distribution is skewed due to the presence of small and large banks in the sample. In such case the use of variable returns to the scale (VRS) raise the possibility that larger banks would appear as efficient n the sample for the simple reason that there are no truly efficient banks. This study will use both CRS and VRS for the analysis.

IV. EMPIRICAL STUDY

4.1. PROFILE OF BANK FOR INVESTMENT AND DEVELOPMENT OF VIETNAM (BIDV)

Bank for Investment and Development of Vietnam (BIDV), founded in April 26, 1957 in Hanoi, Vietnam, is one of the four largest state-owned commercial banks in Vietnam. With its strength and experience in medium and long-term project financing, BIDV has been playing a leading role in Vietnam banking system during the last 5 decades. Recently, BIDV has implemented successfully the Banking System Modernization Project in order to become a diversified, universal and comprehensive bank.

With more than 16,000 officers, employees and financial consultants who are well-qualified and well-trained with full experience and have been accumulated and transferred for over half of a century, BIDV provides a wide range of commercial banking services and investment banking through the operation at the Head Office, the branch system, wholly-owned subsidiaries and joint ventures. BIDV has following subsidiaries and affiliates:

- BIDV Securities Co.
- BIDV Insurance Co.
- BIDV Leasing Co.
- BIDV Asset Management Co.
- Vid-Public Bank
- Lao Viet Bank
- Vietnam-Russia Bank
- BIDV Tower JV Co.
- BIDV-Vietnam Partners Investment Management Co.

For many years, BIDV has been known and recognized as one of the largest banking brand in Vietnam and certified as a trademark in the U.S. and also rewarded annually from organizations, financial institutions at home country and abroad.

Customers of BIDV include different fields: from Enterprises such as corporations, small and medium enterprises to financial institutions like World Bank, ADB, JBIC, NIB ... or also

Individuals. It has continuously tried to reach the goal of becoming a retail bank of high standards.

4.2. OVERVIEW OF TAIWANESE BANKING SYSTEM

Taiwan is a highly open economy which has been ranked among the top 20 trading countries in the world for many consecutive years. Along with the rapid development of economy, Taiwan's banking industry has experienced major structural transformations over the past decades and is consolidating at an accelerating pace. Although banking industry was over-regulated in Taiwan in the past, but in recent years, it becomes increasingly competitive due to the financial deregulation, globalization and liberalization of financial markets.

Taiwanese banks offer a various range of services which includes receiving deposits, making loans, handling trade financing, providing guarantees and discounting bills and notes. Mostly they are also involved in underwriting and trading securities, managing bond and debenture issues and in providing savings-account facilities. Taiwanese banking system can divide the domestic banks into two categories:

* State owned banks/government banks: this group of bank refers to those that are wholly owned by the government or where the government has an ownership percentage more than 20 percent.

There used to be 5 government banks which are wholly owned by the government but by the end of 2005 there are only 3:

- 1) Bank of Taiwan
- 2) Land Bank of Taiwan and
- 3) Export-Import Bank of ROC

In addition, there are some banks that the ownership percentage ranges between 20 percent and 100 percent.

* Private Banks: these banks are viewed as the key backbone of Taiwanese banking system. Until now, Taiwan has over 40 private banks and they outperform government banks in profitability.

4.3. CAMEL ANALYSIS OF BIDV:

As stated in chapters before, CAMEL is the abbreviation of five measuring scales of the

financial institution: capital adequacy, asset quality, management, earning and liquidity.

4.3.1. Capital Adequacy

Capital base of banks facilitates depositors in forming their risk perception about the banks. Capital Adequacy is a measure of a bank's financial strength, in particular its ability to cushion operational and abnormal losses. A bank should have adequate capital to support its risk assets in accordance with the risk-weighted capital ratio framework. Also, this is the key parameter for financial managers to maintain adequate levels of capitalization.

4.3.1.1. Indicators for measuring Capital Adequacy:

Indicators	Definition	Effect
Capital Adequacy Ratio	CAR is a key measure of a bank's capital. It is expressed as a percentage of a bank's risk weighted credit exposures.	(+) : Higher Ratio, higher efficiency of Capital Management
Equity Capital Ratio	The equity capital ratio is a key measure of financial institutions' solvency, such as banks' ability to withstand stresses and absorb losses. It is calculated as a percentage of (non-risk-weighted) total assets.	(+) : Higher Ratio, higher efficiency of Capital Management

4.3.1.2. Analysis of BIDV performance:

4.3.1.2.1. Capital Adequacy Ratio

$$CAR = \frac{\text{Tier One Capital} + \text{Tier Two Capital}}{\text{Risk Weighted Assets}}$$

Two types of capital are measured:

- Tier one capital: absorb losses without a bank being required to cease trading
- Tier two capital: absorb losses in the event of a winding up and so provides a lesser degree of protection to depositors.

Table 1: Capital Adequacy Ratio of BIDV during 2006-2010

Particulars	2006	2007	2008	2009	2010
BIDV CAR	9.16%	11%	8.94%	9.53%	9.32%

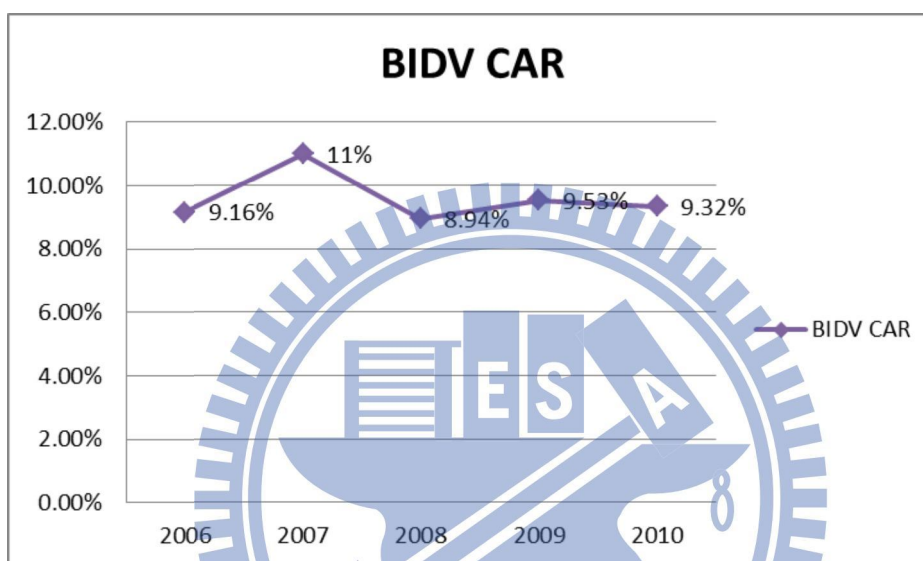


Figure 3: Capital Adequacy Ratio of BIDV during 2006-2010

Source: Annual Reports of BIDV

Bank for Investment and Development of Vietnam (BIDV) keeps high stability to provide enough capital for its operating activities during the 5 years period from 2006 to 2010:

- CAR of BIDV always meets the requirement of international and national standards. According to Bank Supervision Regulation Committee (The Basel Committee) of Bank for International Settlements, minimum 8% CAR is required; and according to regulations of Vietnam State Bank, minimum 9% CAR is required.
- Throughout 5 latest years, CAR of BIDV fluctuated but the main trend still quite slightly upward. In 2010, the number witnessed small decrease but very little

In 2010, CAR of BIDV was 9.32% showing that the bank is in comfortable position to gain the trust from investors and absorb the losses. This ratio also prove that BIDV is not only

enough finance to ensure its function in paying debts or supply loans for customers but also can broaden its investment in other fields.

4.3.1.2.2. Equity Capital Ratio:

Equity Capital Ratio is primary measurement for judging capital strength.

$$\text{Equity Capital Ratio} = \text{Equity Capital} / \text{Total Assets}$$

Table 2: Equity to assets relating indicators of BIDV during 2005-2010

Particulars	2005	2006	2007	2008	2009	2010
Equity	3150	4428	8405	9969	13977	20583
Total Assets	117,976	158,165	201,382	242,316	292,198	361,954
Equity/Total Assets	2.67%	2.8%	4.17%	4.11%	4.78%	5.67%

It can be apparently seen from the chart that Equity Capital of BIDV recently witnessed a strongly dramatic growth, throughout the period from 2005 till 2010. This number stood at 20,593 million VND in 2010, being tenth times compared to this of 2005. The pace of remarkable rise of Equity Capital is greater than the speed of growth in Total Assets, leading to the increase of Equity Capital Ratio. This result proves the strength of capital structure in BIDV is improved year after year and become efficiency in capital management.

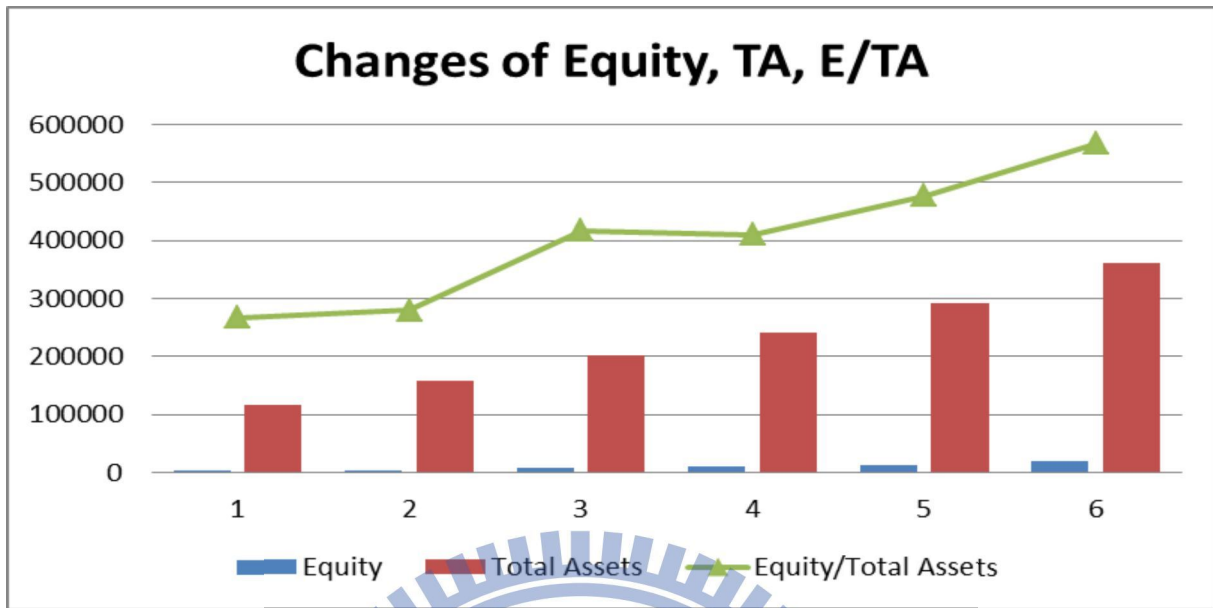


Figure 4: Equity/Total Ratio of BIDV during 2005-2010

Source: Annual Reports of BIDV

4.3.2. ASSET QUALITY

Asset quality has direct impact on the financial performance of a bank. The quality of assets particularly, loan assets and investments, would depend largely on the risk management system of the institution. The value of loan assets would depend on the realizable value of the collateral while investment assets would depend on the market value.

4.3.2.1. Indicators for measuring Asset Quality:

The health of a bank largely depends on the quality of assets held by them, and quality of the assets relies on the financial health of their borrowers. In general, many indicators can be used to measure the quality of assets held by a bank, such as Coverage Ratio, Overdue Loans to Total Loan Ratio (OLTL), 90-Day Overdue Loans to Total Loans Ratio (90DOLL). But, in case of BIDV, three simple indicators— asset growth rate, loan concentration tables, and loan loss reserve ratio (LLR)—are used to measure the quality of assets being held by banks.

Indicators	Definition	Effects
Asset Growth Rate	This ratio details the change in total assets over the past 12 months. It is computed by subtracting prior-period total assets from current-period total assets, then dividing the difference by prior-period total assets.	(+): Higher ratio, better efficiency of Assets Management
Loan loss reserve ratio	Indicates the adequacy of reserves in relation to the portfolio.	(-): Lower ratio, better efficiency of Assets Management
Loan structure	Indicates efficiency of Assets by analyzing structure of Loans	

4.3.2.2. Analysis of Asset Quality in BIDV

4.3.2.2.1. Asset Growth Rate:

Total assets of BIDV in 2010 were 361,954 million VND, increased strongly by 24% compared to this of 2009. However, the pace of increase in 2009-2010 was higher than that of 2008-2009 and lower than that of 3 prior year periods. This is due to the stronger financial crisis of banks in Vietnam in particular and in the international financial market in general.

But overall, the total assets of BIDV experienced the decidedly upward trend and in 2010, it still stood at the second highest level in Vietnam Banking industry, only followed the Agriculture Bank.

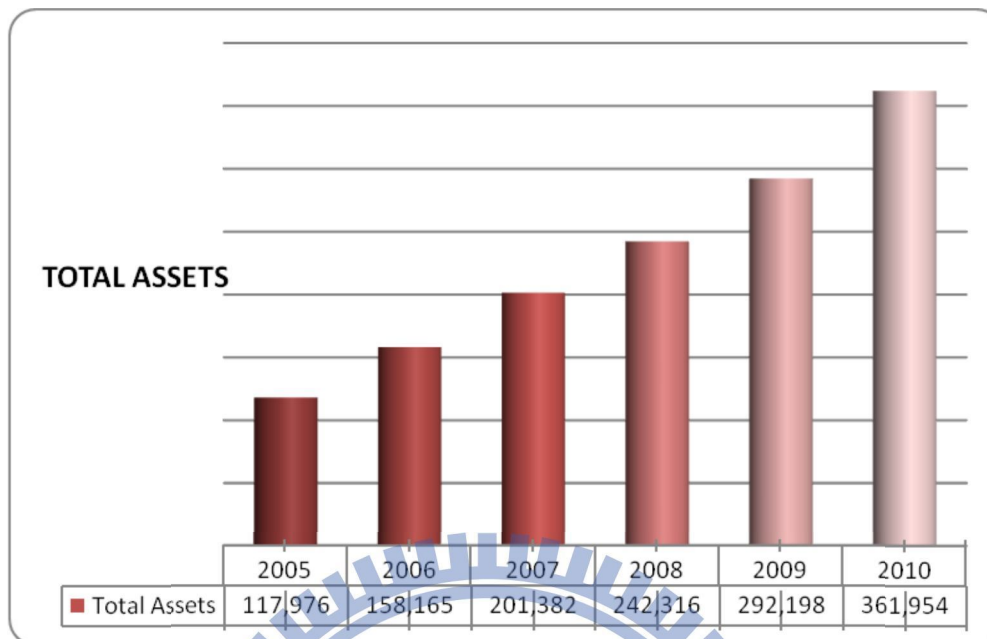


Figure 5: Total Assets of BIDV during 2005-2010

Source: Annual Report of BIDV

4.3.2.2.2. Loan Loss Reserve Ratio

$$LLRTL = \text{Loan Loss Reserves} / \text{Total Loans}$$

Table 3: LLRTL of BIDV during 2007-2010

Particulars	2007	2008	2009	2010
Loan Loss Reserves	6,387	8,346	9,094	9,404
Loan	126,617	154,176	198,979	247,733
LLRTL	5.04%	5.4%	4.6%	3.8%

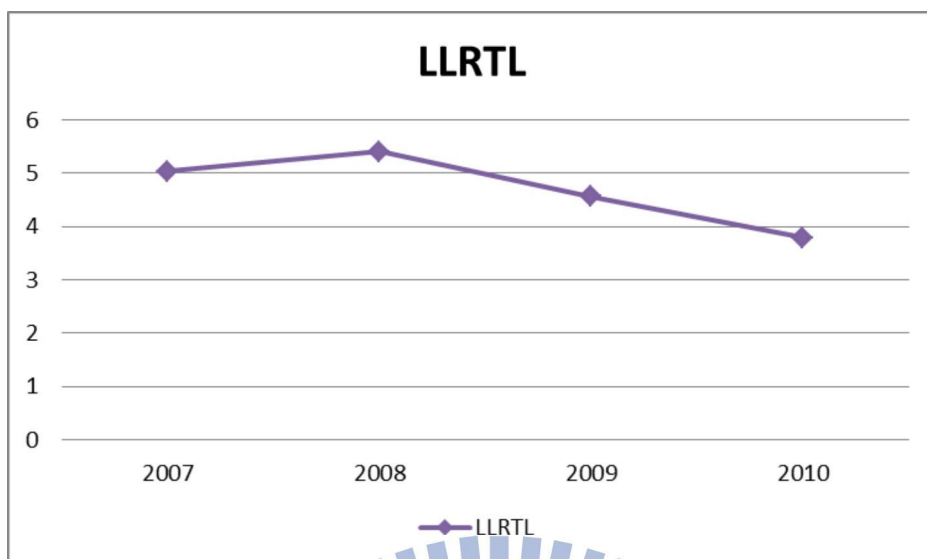


Figure 6: LLRTL of BIDV during 2007-2010

Source: Caculated numbers from Annual Reports of BIDV

The percentage of reverse to Loans experienced slight rise in 2008 to about 5.4% but after that saw a marked drop throughout 2008-2010 periods. This is a good news for BIDV since it indicates that BIDV is stable in its lending base in particular and the asset management is improved year by year in general.

4.3.2.2.3. Loan Structure

Loans of BIDV comprise of different types in many aspects, providing money for from economic organizations to individual customers, from domestic companies to overseas entities.

Table 4: Structure of Loans

Particulars	2009	2010
Loans to entities and individuals	191,262	232,409
Discounting valuable papers	2,320	6,044
Receivables from finance leases	2,877	2,830
Compulsory loans to customers	0,001	0,295

ODA loans	8,268	14,779
State-directed loans	754	445
Trusted Loans	539	2,329
Loans to overseas entities and individual	378	1,014

Total loans of BIDV increased significantly from 2009 to 2010, especially in category of loans to entities and individuals, both in local and overseas section. Similarly, trusted loans also grew strongly from 539 to 2,329 billion VND. On the other hand, State-directed loans went down to only 445 billion VND, occupying very small amount of BIDV loans in 2010. In addition, generally, loans to entities and individuals always had the highest proportion. Two next biggest following categories are ODA loans and finance leases. State-directed loans, loans to overseas customers and trusted loans are types that only obtained very small amount of loans in BIDV.

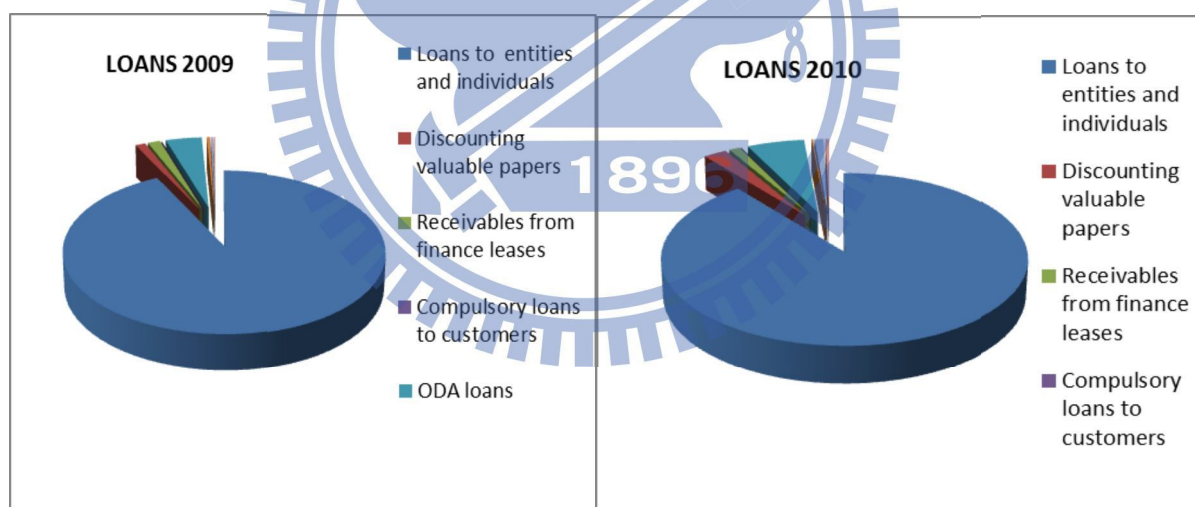


Figure 7: Structure of Loans in BIDV

Source: Annual Reports of BIDV

ODA loans consist of loans to customers funded by official development programs through the MOF. The Bank acts as a loan administration agency in this arrangement. Accordingly, the Bank does not bear any credit risk in relation to these loans as specified in the agreements with ODA donors and the MOF; any default by the borrowers will be reported to the ODA

donors and the MOF for resolution.

State-directed loans are loans provided by the Bank to specific entities and projects according to Development Plans under the instructions of the Government. These loans are respectively funded by borrowings and trust funds from the SBV and the MOF. The SBV and MOF determine interest rate for these loans.

4.3.3. MANAGEMENT QUALITY

Management is one of most important parameters to value the quality of a bank. Hence, it goes without doubting that management is generally accorded greater weighting in the assessment of the overall CAMEL composite rating.

Management is coordination between material, financial and human resources, at a planning process, organization, direction and controlling in order to achieve the respective goals⁵.

Nowadays, with the increased competition among Vietnam Banks, efficiency and effectiveness in management are viewed as leading motivations to develop the bank, along with the improvement of employees' productivity in each bank. To measure the quality of management, aside from counted indicators such as Total Advance to Total Deposit (ATD), Business per Employee (BPE), Profit per Employees (PEE), we also can use uncounted parameters, for example, quality of management model, policy development, employees' trainings. These uncounted parameters could be called in general is management structure indicator.

4.3.3.1. Indicators for measuring Management Quality

Indicators	Definition	Effects
Total Advance to Total Deposits	ATD measures the efficiency of management by converting deposits in to advances.	(+): Higher Ratio, better Management Efficiency

Profit per Employee	This ratio indicates the profit after tax generated per person employed.	(+): Higher Ratio, better Management Efficiency
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4.3.3.2. Analysis of Management Quality in BIDV

4.3.3.2.1. Total Advances to Total Deposits (ATD)

$$ATD = \text{Total Advances} / \text{Total Deposits}$$

Table 5: ATD Ratio of BIDV during 2007-2010

Particulars	2007	2008	2009	2010
ATD Ratio	45.69%	48.7%	51.3%	55.4%

Throughout last years, Total Advances to total deposits ratio of BIDV grew dramatically as shown in the below graph, from only 45.69% in 2007 to 55.4 % in 2010, increased by 10%. The growth of ATD presents that BIDV have improved its efficiency in recent years.

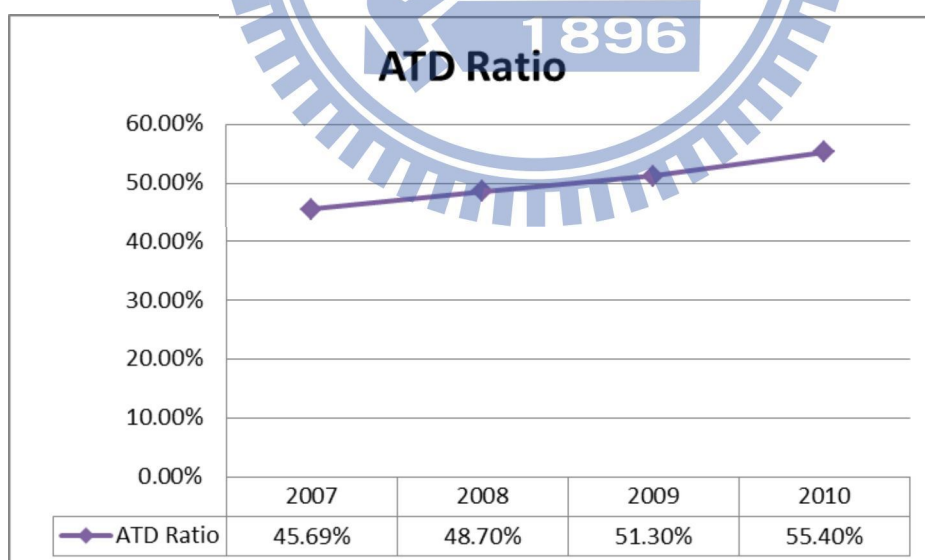


Figure 8: ATD Ratio of BIDV during 2007-2010

Source: Calculated numbers from Annual Reports of BIDV

4.3.3.2.2. Profit per Employee (PPE)

$$PPE = \text{Profit after tax} / \text{Number of Employees}$$

Table 6: PPE-relating indicators of BIDV during 2007-2010

Particulars	2007	2008	2009	2010
Profit after tax	1,531	1,997	2,857	3,758
Number of employees	10,202	12,305	14,436	16,475
PPE	0.15	0.16	0.19	0.22

The PPE of BIDV grew during 2007-2010, proving strong efficiency that BIDV is utilizing its employees. In other words, relatively high profit per employee is a positive sign that suggests BIDV is finding ways to squeeze more profit out of each of its workers.

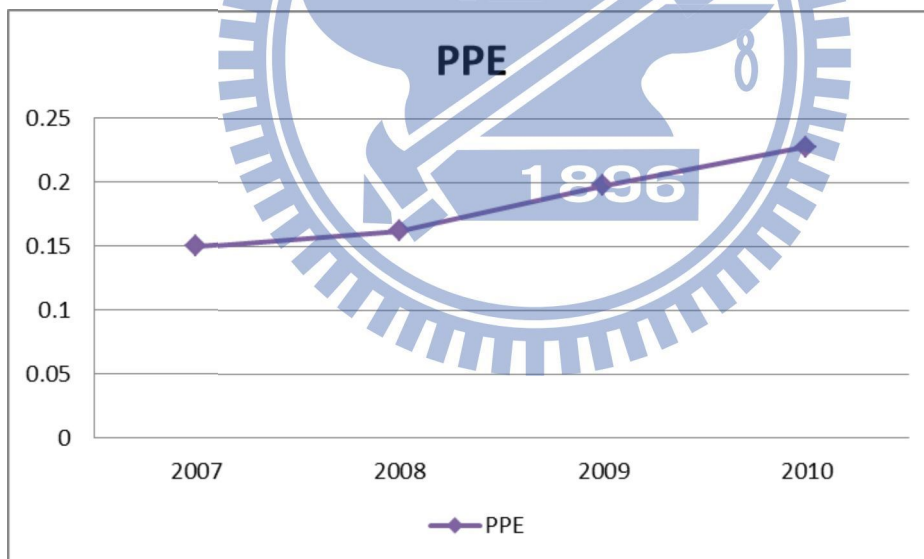


Figure 9: PPE of BIDV during 2007-2010

Source: Calculated numbers from Annual Reports of BIDV

4.3.4. EARNINGS

Earnings determine the ability of a bank to increase capital (through retained earnings),

absorb loan losses, support the future growth of assets, and provide a return to investors.

Hence, earning capacity is one of the indicators of the sound health of a bank.

Earning capacity largely counts on the efficiency of management. Chronically, constantly profit making banks add equity to the total capital fund, reduce the risk of insolvency, and finally increase the wealth of their shareholders.

Although different indicators are used to serve the purpose of finding earnings capacity, the best and most widely used indicators are Return on Assets (ROA), Return on Equity (ROE). However, for in-depth analysis, another indicator, Net Interest Margins (NIM) is also used.

4.3.4.1. Indicators used for measuring Earnings

Indicators	Definition	Effects
Returns on Assets	ROA is an indicator of how profitable a company is relative to its total assets. It is calculated by dividing a company's annual earnings by its total assets.	(+): Higher Ratio, better Earnings Quality
Returns on Equity	ROE reveals how much profit a company earned in comparison to the total amount of shareholder equity found on the balance sheet.	(+): Higher Ratio, better Earnings Quality
Net Interest Margins	NIM is a measure of the difference between the interest income generated by banks and the amount of interest paid out to their lenders, relative to the amount of their assets.	(+): Higher Ratio, better Earnings Quality

4.3.4.2. Analysis of Earnings in BIDV

4.3.4.2.1. Return on Assets

$$ROA = \text{Net Income} / \text{Total Assets}$$

Table 7: ROA-relating indicators of BIDV during 2007-2010

Particulars	2007	2008	2009	2010
Total Assets	201,382	242,316	292,198	361,954
Net Income	1,531	1,997	2,857	3,758
ROA	0.84%	0.89%	1.04%	1.13%

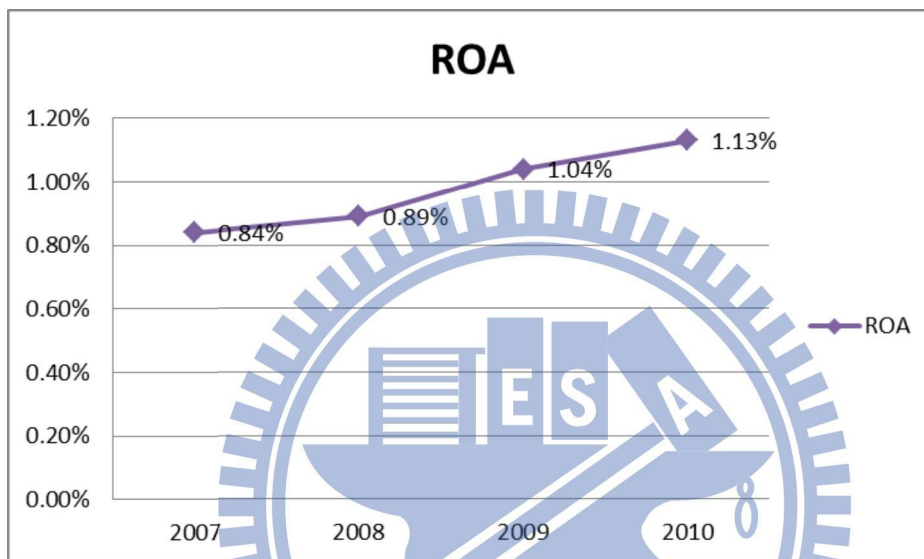


Figure 10: Return on Assets of BIDV during 2007-2010

Source: Calculated numbers from Annual Reports of BIDV

Since Return on Assets reflects the profitability and earnings were generated from invested capital (assets). Therefore, higher Return on Assets ratio is better for bank because that means bank can receive more money on less investment.

From the chart we can see that in BIDV, ROA ratio increased gradually throughout 5 years period, with only 0.84 % in 2007 but after that increased to 1.04 % in 2009 and 1.13% in 2010. The main reason for this rise is because of the percent of increment in net income is higher than that of total assets (as mentioned in below graph V).

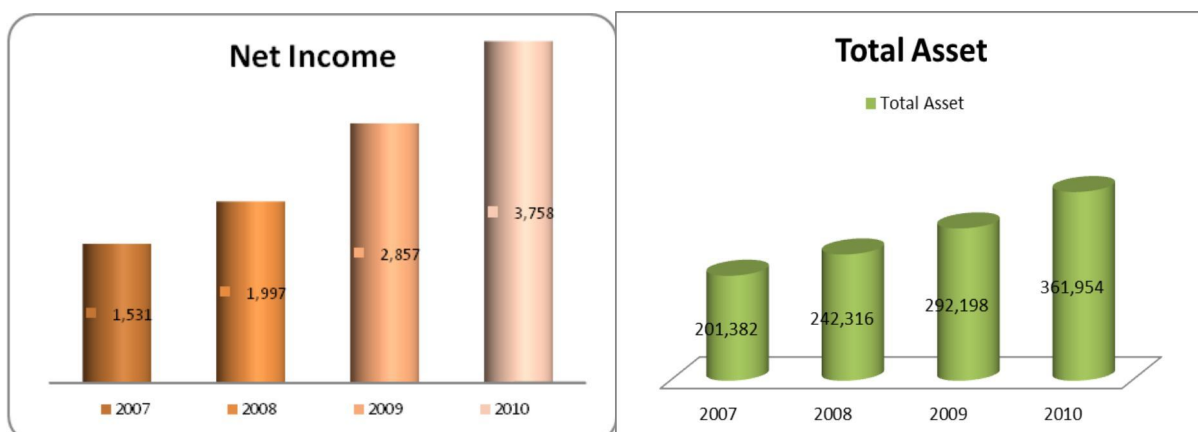


Figure 11: Trend of Net Income and Total Assets of BIDV during 2007-2010

Source: Annual Reports of BIDV

In conclusion, the growth of BIDV occurred both in quality and quantity. In 2010, along with about 25 % of increment in profit after tax, total assets also went up by 19%. This result proves the high efficiency in operating activities of BIDV in recent years regardless of the financial crisis.

4.3.4.2.2. Return on Equity

$$\text{Return on Equity} = \text{Net Income} / \text{Equity}$$

Table 8: ROE-relating Indicators of BIDV during 2007-2010

Particulars	2007	2008	2009	2010
Equity	8,405	9,969	13,977	20,583
Net Income	1,531	1,997	2,857	3,758
ROE	15.96%	15.9%	18.11%	17.95%

Return on Equity of BIDV remained quite stable for 2 periods 2007- 2008 and 2009 and 2010 but the time between 2008 and 2009 saw a remarked rise from 15.9% to 18.11 %. This is attributed to the strong change of equity and net income. However in 2010, ROE of BIDV decreased slightly from 18.11% to 17.95%. This is because the increase in net income did not

catch up to the rise in equity.

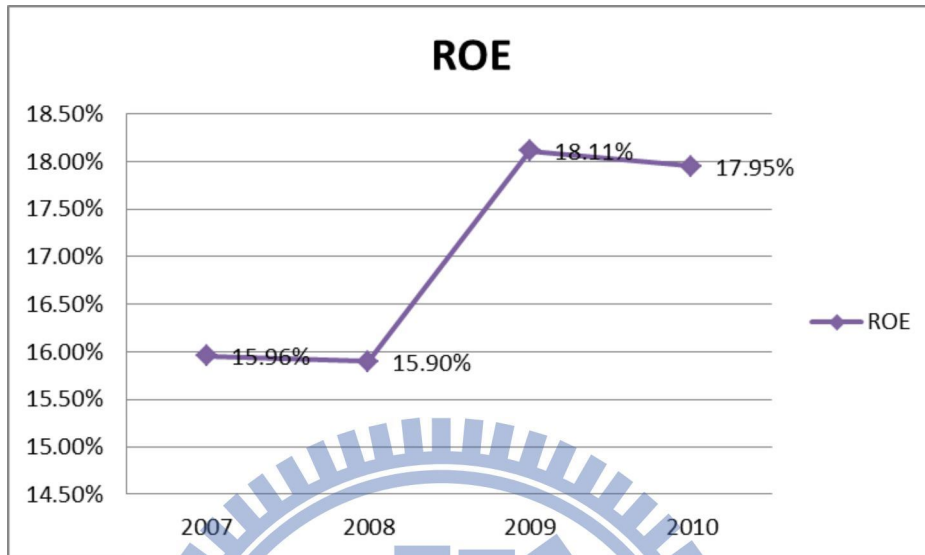


Figure 12: Return on Equity of BIDV during 2007-2010

Source: Calculated numbers from Annual Reports of BIDV

4.3.4.2.3. Net Interest Margins

$$\text{Net Interest Margins} = \text{Net Interest Income} / \text{Interest Earning Assets}$$

Table 9: Net Interest Margins of BIDV

Particulars	2009	2010
Net Interest Margins	2.63%	2.96%

Net Interest Margins of BIDV in 2010 was 2.96%, it is quite low compared to other leading banks in Vietnam banking system such as Vietcombank or VietinBank. However, it is still above the average level of the whole banking industry.

The main reason for this result of Net Interest Margins in BIDV is because of its policies for providing loans. BIDV limited loans with high interest and followed tightly regulations of State Banks. Hence, the profit gained from these types of loans is very low. It partly caused the low NIM in BIDV.

Table 10: NIM indicators of some Vietnam Banks

Banks	BIDV	Vietcombank	Vietin Bank	Average
2010	2.96%	3.01%	3.56%	2.85%

4.3.5. LIQUIDITY

Liquidity is the ability of conformity of the decrease in the amounts and increase in the assets in order to pay the expenses with a reasonable cost. It is, therefore, generally assessed in terms of overall assets and liability management, as mismatching gives rise to liquidity risk.

A bank must always be liquid to meet the demand of depositors and creditors in order to maintain public confidence. There needs to be an effective asset and liability management system to minimize maturity mismatches between assets and liabilities and to optimize returns. As liquidity has inverse relationship with profitability, a bank must strike a balance between liquidity and profitability.

There are some appropriate ratios used for measuring bank liquidity. Deposit Growth Rate, Loan to deposit ratio and Liquid Assets to Total Deposits (LATD) ratio are examples.

4.3.5.1. Indicators for measuring Liquidity

Indicators	Definition	Effects
Deposit Growth Rate	Deposit Growth Rate indicates how a bank is funding the asset side of its balance sheet. It is computed by subtracting prior-period total deposits from current-period total deposits, then dividing the difference by prior-period total deposits.	(+): Higher Ratio, better Liquidity Management
Loan to Deposit Ratio	LDR indicates the percentage of a bank's loans funded through deposits (measures funding by	(+): Higher Ratio, better Liquidity

	borrowing as opposed to equity)	Management
Liquid Assets to Total Deposits	LATD measures deposits matched to investments and whether they could be converted quickly to cover redemptions.	(+): Higher Ratio, better Liquidity Management

4.3.5.2. Analysis of Liquidity in BIDV

4.3.5.2.1. Deposit Growth Rate

Deposits in BIDV come from economics entities, individuals and some others. Of all these types, source from entities is slightly greater than from individuals.

Table 11: Deposit Growth Rate of BIDV from 2007-2010

Particulars	2007	2008	2009	2010
Deposit	135,336	163,379	187,280	244,700
Deposit Growth Rate compared to 2007	100%	120.7%	138.4%	180.8%

From the table we can see obviously that deposits in BIDV increased year by year with high pace. Especially, from 2009 to 2010, deposits experienced a strong rise to 180,8% compared to 2007. This contributed to the high liquidity capacity of BIDV and ensured that BIDV could be reliable access to sufficient sources of funds on favorable terms to meet present and anticipated liquidity needs.

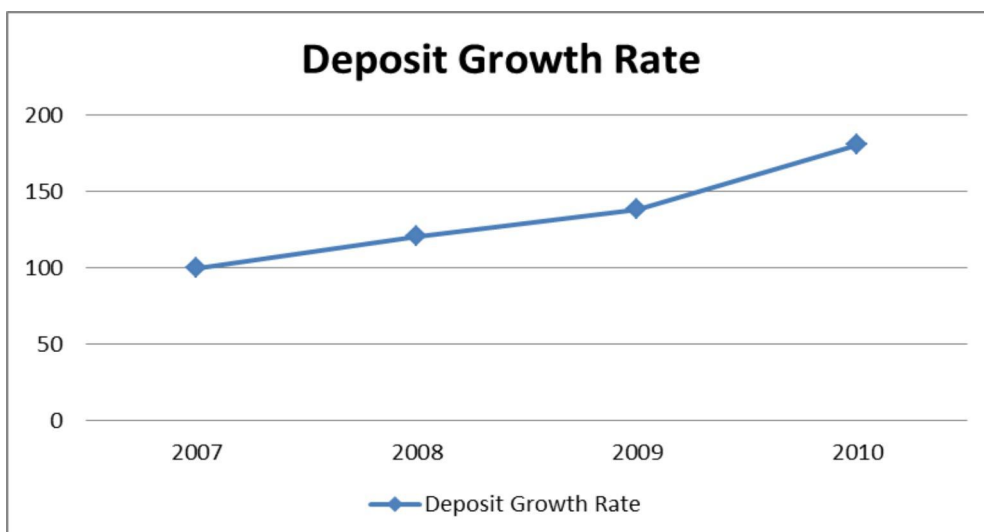


Figure 13: Deposit Growth Rate of BIDV during 2007-2010

Source: calculated numbers from Annual Reports of BIDV

4.3.5.2.2. Loan to Deposit Ratio:

$$\text{Loan to Deposit Ratio (LDR)} = \text{Loans/Deposits}$$

Table 12: Loan to Deposit Ratio of BIDV during 2007-2010

Particulars	2007	2008	2009	2010
Loan	126,617	154,176	198,979	247,733
Deposit	135,336	163,379	187,280	244,700
Loan to Deposit Ratio	0.936	0.943	1.06	1.01

Both Loans and Deposits in BIDV increased from 2007 to 2010 but the increment of Loan is greater than that of Deposits.

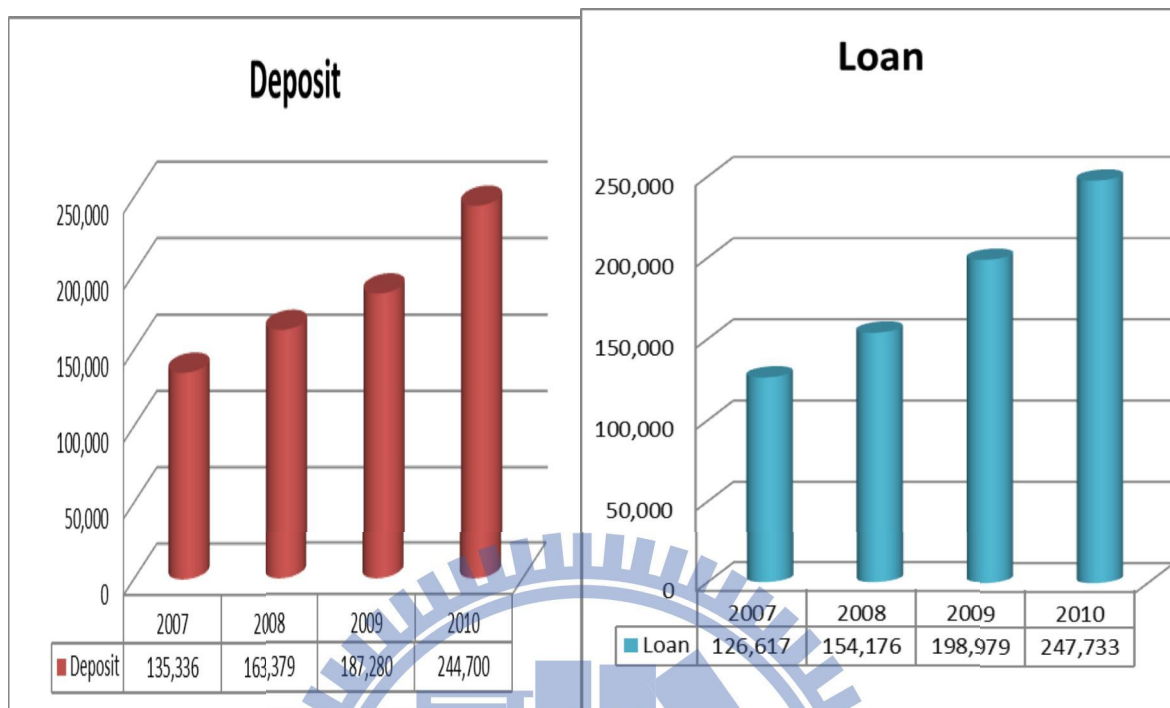


Figure 14: Change of Deposits and Loans annually during 2007-2010

Source: Annual Reports of BIDV

It is obviously seen that during selected times, LDR of BIDV always stood around 1. That is a good and safe level, which means LDR is not too high so that bank must sell the loans at loss in near future to meet depositors' claims, or it is not too low so that bank is likely to obtain low profit.

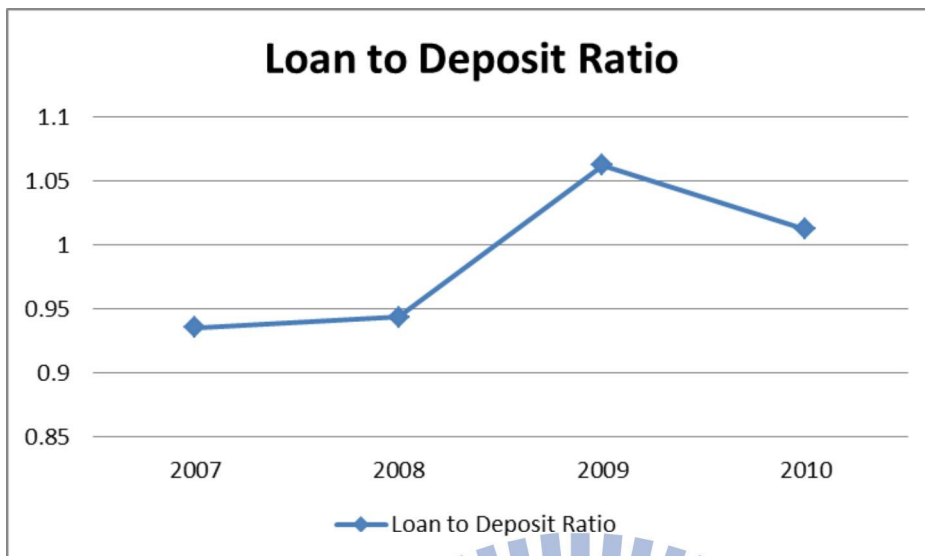


Figure 15: Loan to Deposit Ratio of BIDV

Sources: Calculated numbers from annual reports of BIDV

In 2007 and 2008, LDR was less than 1, that means Loans was less than Deposits. However, from 2009 onwards, this trend was changed and Loans that BIDV provided is bigger than Deposits it received from customers. This shows a good sign for better liquidity capacity of BIDV in coming years.

4.3.5.2.3. Liquid Assets to Total Deposits

$$LATD = \text{Liquid Assets} / \text{Total Deposits}$$

Liquid Assets include cash in hand, balance with RBI, balance with other banks (both in India and abroad), and money at call and short notice. Total Deposits include demand deposits, saving deposits, term deposits and deposits of other banks.

Table 13: LALD-relating indicators of BIDV during 2007-2010

Particulars	2007	2008	2009	2010
Liquid Assets	74,765	88,139	93,218	114,220
Deposit	135,336	163,379	187,280	244,700
LATD	55,2%	53.9%	49.8%	46.7%

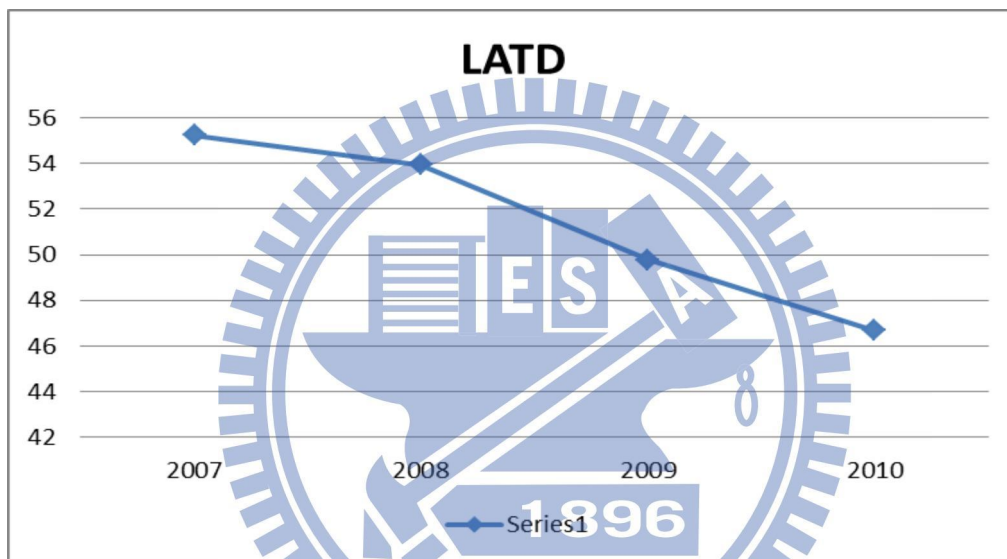


Figure 16: LATD Ratio of BIDV during 2007-2010

Source: Calculated numbers from Annual Reports of BIDV

We can see in the table and graph above that although the LALD Ratio of BIDV witnessed downward trend recently, but it was still at high level, about 46.7. It presents that the liquidity position of the bank could be ensured to meet the amount of total deposits. In another words, liquidity situation of BIDV is quite good, it could always cope up with the total deposits.

In brief, as illustrated above, it could be concluded that the performance of BIDV through CAMEL is very good. The capital, assets, management, earnings and Liquidity indicators prove that BIDV is an efficient bank.

4.4. DEA ANALYSIS

4.4.1. Selection of Inputs and Outputs

This research employs CCR model of DEA to calculate efficiency indexes of 21 Taiwanese banks and a Vietnamese Bank- BIDV which is top five Vietnamese banks. Calculation processes of efficiency indexes achieved by LINDO software of operational research. Efficiency of a bank is acknowledged to many indicators. Although the mystification of this issue will be abolished by employing the DEA approach, the appropriate list of inputs and outputs has to be viewed properly. Therefore, in modeling bank behavior, this study follows intermediation approach in which DEA model consists of 8 inputs and 1 output, as follows:

Table 14: Define of Input and Output Variables in DEA Model

Character of Variables	Name
INPUTS	Tier 1 capital / Risk weighted assets
	BIS
	Equity Capital / Total assets
	Loan Loss reserve / Loans
	After-tax Profit / number of employee
	Net Interest Margin / Interest Earnings assets
	Total Loans / Deposits
	Liquid assets / deposits
OUTPUTS	Return on Equity

The data of input and output indexes are available in the annual reports of Taiwanese and Vietnamese banks which release these information on corresponding banks' website.

Table 15: Taiwanese Banks and BIDV Summary Statistics 2010

Bank name	Tier 1 capital / Risk weighted assets	BIS	Equity Capital / Total assets	Loan reserve / Loans	After-tax Profit / no. employee	Int. margin / int. earn. assets	Loans/ Deposits	Liquid assets / deposits	Return on equity %
Kaohsiung	7.05	9.40	4.45	0.54	266	0.84	87.35	2.68	1.34
Cosmos	8.79	15.72	9.73	4.67	-1811	6.08	62.19	9.43	-25.66
Union	7.85	10.01	5.53	0.76	656	1.95	63.58	8.76	7.5
Far Eastern	9.01	13.18	5.46	1.55	739	1.49	68.94	7.88	10.08
TC Bank	9.31	11.07	5.92	1.55	475	1.34	82.19	1.84	3.72
EnTie	9.89	14.40	5.94	0.38	1440	1.23	72.61	23.47	10.36
Bank of Taipei	11.20	12.04	10.12	0.90	-81	1.08	82.36	15.2	10.27
Chang Hwa	8.19	10.74	5.76	1.29	661	1.05	84.89	1.74	9.34
King's Town	12.16	12.93	7.74	1.50	2047	1.87	72	16.92	15.24
First Bank	7.00	10.36	4.81	1.04	777	1.03	79.34	1.55	6.82
Hua Nan	7.54	11.51	4.90	0.88	605	1.02	79.97	4.11	6.87
China Trust	11.58	13.53	7.45	1.11	1628	1.61	74.35	6.06	10.61
Fubon	9.18	12.99	5.74	0.64	1201	1.15	73.81	3.89	8.75
SinoPac	8.89	11.90	5.96	0.76	825	1.43	75.73	2.4	5.46
E. Sun	8.55	11.55	5.11	0.60	972	1.4	66.08	3.86	7.48
Yuanta	7.66	10.73	5.44	1.81	702	1.33	74.25	9.01	5.43
Taishing	9.31	13.58	6.50	1.15	1272	1.86	72.33	3.28	14.32
Shin Kong	8.07	10.95	5.22	0.93	619	1.69	79.16	47.76	8.57
Jihsun	9.02	9.44	6.44	0.92	-253	1.41	70.89	9.68	8.4
Cooperative	7.08	11.06	4.47	1.01	695	1.1	82.56	3.55	6.54
Taichung	8.15	11.10	5.70	1.09	833	1.76	81.04	34.01	2.37
BIDV	.	9.32	5.67	3.80	846	2.96	1.01	46.7	17.95

4.4.2. Empirical Result and Analysis

Table 16: Efficiency Results Overall Sample of Taiwanese Banks and BIDV

2010	CRS	VRS	Scale	Return to Scale
Kaohsiung	1	1	1	-
Cosmos	0	1	0	irs
Union	1	1	1	-
Far Eastern	1	1	1	-
TC Bank	0.899	1	0.899	irs
EnTie	1	1	1	-
Bank of Taipei	1	1	1	-
Chang Hwa	1	1	1	-
King's Town	0.960	1	0.960	drs
First Bank	1	1	1	-
Hua Nan	1	1	1	-
China Trust	0.924	0.927	0.997	irs
Fubon	1	1	1	-
SinoPac	1	1	1	-
E. Sun	1	1	1	-
Yuanta	0.873	0.948	0.920	irs
Taishing	1	1	1	-
Shin Kong	1	1	1	-
Jihsun	1	1	1	-
Cooperative	1	1	1	-
Taichung	0.722	0.868	0.890	irs
BIDV	1	1	1	-
MEAN	0.929	0.988	0.939	

Table 15 presents the summary of Taiwanese banks indicators statistics calculated from the balance sheet in the sample study. The equity capital, total deposits, total loans, liquid assets, total assets and some others show the efficient performance of selected banks. From this indicators, numbers considered as inputs and outputs will analyzed by DEA program.

In order to provide baseline for comparison of efficiencies of a Vietnamese Bank- BIDV and Taiwanese Banking sector, firstly the thesis compute efficiency scores for BIDV and Taiwanese, and data year is in 2010. The results are presented as above table 16.

After comparing the empirical result of Vietnamese bank – BIDV with that of 21 Taiwanese banks, the research shows that the performance of BIDV is efficient and is quite better than some Taiwanese banks.

Besides, from Table 16, it is clear that Taiwanese banks and BIDV show considerable overall efficiency (CRS) across sample period with mean 0.929. In addition, it is interesting to note that some of Taiwanese banks experienced slight inefficiencies in 2010 compared to Vietnamese Bank – BIDV. For example, Ta Chong bank with CRS is 0.899 and VRS is 1, King's Town with CRS is 0.960 and VRS is 1, China Trust with CRS is 0.924 and VRS is 0.967, Yuanta with CRS is 0.873 and VRS is 0.948, Taichung with CRS is 0.722 and VRS is 0.868. And the level of inefficiency in 2010 is more attributable to pure technical inefficiency.

Concentrating on scale efficiency (Scale), except Cosmos, it is obvious that the largest degrees of scale inefficiencies come from Ta Chong bank, with the lowest Scale score is 0.899. It is noticeable that only one of the common Taiwanese banks in 2010 exhibited decreasing returns to scale - King's Town Bank, whilst most other banks show constant returns to scale. There are 5 Taiwanese Banks show increasing returns to scale. And BIDV also exhibited constant returns to scale.

To conclude, based on selected inputs and output, the result shows that BIDV is an efficient

bank and there is only little slack in need of improvement. Additionally, it could be one of the efficient operating models to be followed by some of inefficient Taiwanese banks with similar scale. The reason behind this success of BIDV is resulted from the high quality of capitals, investments as well as its own financial strengths. In addition, BIDV has developed proper strategies and concentrated much on improving the management and the employees' quality. And since it is viewed as one of the most important banks of Vietnamese Banking system, BIDV has also highly regulated from the state. As a result, BIDV currently become the second biggest bank in Vietnam.



V. CONCLUSION

Examination of the empirical analysis makes it possible to shed some light on findings, give recommendations and draw some conclusions.

5.1. FINDINGS

5.1.1. CAMEL analysis of BIDV

5.1.1.1. Capital Adequacy

The bank is maintaining a capital adequacy ratio, which is above the minimum requirement and also above industry average. BASEL norm prescribes a capital adequacy ratio of 8%, while BIDV is maintaining a capital adequacy ratio of almost above 9% for last five consecutive years

5.1.1.2. Assets

Assets of BIDV increased significantly during the period of 2007-2011. In addition, the structure of loans was enhanced. It shows that the assets quality in BIDV is becoming better than previous years.

5.1.1.3. Management

It can be observed that there is an increase in PPE and ATD of BIDV within last five years and it talks about the efficiency of the management. On the whole, indicators of management efficiency show relatively healthy of BIDV.

5.1.1.4. Earnings

The earnings of BIDV have been average and for last five years, both ROA and ROE of the bank witnessed remarkable rise. As a result, earnings of BIDV are strongly improved year by year.

5.1.1.5. Liquidity

From the analysis of indicators, it is quite clear that liquidity capacity of BIDV is quite good. The liquidity position enhanced and it proves that efficiency of BIDV.

5.1.2. Comparison between BIDV and Taiwanese banks

Compared to 21 selected Taiwanese banks, performance of BIDV is good. Some Taiwanese banks are still less efficient than BIDV and they should find the suitable ways to enhance their efficiency in the future.

5.2. RECOMMENDATION

Overall, based on empirical results, the study implies the sound financial healthy of Bank for Development and Investment of Vietnam and there are a few of areas which are in need of improvement for BIDV. However, with the purpose of enhancing efficiency for not only BIDV but also other Vietnamese banks, there are some suggestions as follows:

- The CAMEL system is getting internationally standardized with the coming of BASEL III accords, so the Vietnamese banks and BIDV should strengthen internal processes so as to cope with the standards.
- Banks should increase awareness among the employees regarding the performance evaluation technique used in the banks and also regarding the CAMEL and DEA, especially among the private sector banks' employees. This can be done by organizing special training programs or by distributing information pamphlets to them, because banks with higher awareness of these models will find much easier strategies to enhance efficiency.

5.3. CONCLUSION AND LIMITATIONS

The Vietnam banking market is about to become more competitive, both because of deregulation of national banks, and because of entrance by foreign banks. Added to the fact that the financial market has changed dramatically over years, it is in need of the thorough bank examination, of which the CAMEL model and DEA method play crucial roles in the supervisory process.

Through the case of BIDV, one of leading bank in Vietnam, as can be apparently seen that CAMEL assessment framework is a useful tool in banking supervision and as a result, currently it becomes more popular among regulators. CAMEL approach is beneficial as it is an internationally standardized model. Although it has disadvantages of not following the Vietnamese banks closely as well as ignoring the interaction with bank's top management,

the findings of this thesis still reveal that it is the dominant model in assessing banks' performance of BIDV and Vietnamese banks.

In addition, by using DEA to compare the efficiency of BIDV and Taiwanese banks, we can indicate whether the efficiency of BIDV is or not. And the empirical results illustrate that BIDV performance deserves with the rewards and its reputation in Vietnam banking sector. In addition, through the research, it goes without doubt that DEA is also a proper instrument to examine the performance of banks and we hope that in the future, it could be a popular method to assess the differences in efficiency of Vietnamese banks.

Last but not least important, the thesis could give relevance for individual investors, bankers and some people who are working in Banking industry in particular and financial market in general. For investors, it could help them better understand about their investments on their own rather than seeking the investment agencies. It will also show the current situation of the banks and their strengths and weaknesses to investors. Hence, this could help investors make precise and timely decisions towards their investment. For individual banks, the thesis provides them the overview of international standard models, help them more access to the global financial market and attract more foreign investors.

The thesis still has some limitations. Due to the disadvantages of DEA method, it is fairly tough to access all types of indicators as inputs, which would be limitations of this study.

As a result, the result of this thesis is quietly subject to the selected inputs. In addition, the thesis is also only allowed to compare the case of a Vietnamese bank to Taiwanese banks.

In the future researches, we should deeper investigate about the international banks and they can be used as inputs in the global banking system.

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