尼泊尔商业银行绩效的评价及与宏观财务指标关联性研究

PERFORMANCE APPRAISAL OF COMMERCIAL BANKS AND LINKAGE FINANCIAL INDICATORS WITH ECONOMIC GROWTH IN NEPAL

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PERFORMANCE APPRAISAL OF COMMERCIAL BANKS AND LINKAGE FINANCIAL INDICATORS WITH ECONOMIC GROWTH IN NEPAL

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Abstract

Banking industry, normally, occupies a bigger chunk in the financial system of a nation. Same is the case in Nepal. The growth of the banking system coupled with the rapid development in information and communication technology not only increases the banking products to the consumers but also fosters the competition and increases the complexities, risks and challenges. Although the first Nepalese commercial bank, namely Nepal Bank Limited was established in 1937, the Nepalese commercial banks have the highest growth in the period of 2000 - 2010 with the entry of a large of number of private sector banks. On one hand, the informative banking system increased people awareness and banking habit as well as made them more demanding and choosy. On the other hand, it increased the complexities and risks of failure, too. Risk management is an inevitable component of successful banking. Effective risk management has always been central to safe and sound banking activities. Hence, it is important to check bank performance whether or not banks operate prudently and hold sufficient capital to support the risks. The competitive scenery of the global economic activities needs the productivity-driven banking industry to be paying special attention for its relative level of efficacy compared to its competitors.

Although bank efficiency has been a popular research area in both developed countries and less-developed nations, it has been scarce in Nepal mainly due to the lack of data, be sort of research institutes and be deficient in analytical exploring system. The objective of this study is to analyze the financial performance and efficiency of the Nepalese commercial banks and linkage of their financial indicators with economic growth. This study is considered as the first study that comprehensively investigated bank performance and efficiency using multiple methodologies of financial ratios analysis and data envelopment analysis. This study further addressed the question of whether or not commercial banking performance has significantly been affecting economic growth in Nepal.

The financial performance based on CAMEL Model for different ownership structured commercial banks and selected eighteen individual banks was investigated for the period of 2005 - 2010 in order to determine their financial characteristics and

identify the determinants of the performance. The results showed that public sector banks are significantly less efficient than their counterparts are; however, domestic private banks are equally efficient to foreign-owned (joint venture) banks.

The econometric model (multivariate regression analysis) by formulating two regression models was used to estimate the impact of capital adequacy ratio, non-performing loan ratio, interest expenses to total loan, net interest margin ratio and credit to deposit ratio on the financial profitability, namely return on assets and return on equity of these banks. The results revealed that return on assets was significantly influenced by capital adequacy ratio, interest expenses to total loan and net interest margin, while capital adequacy ratio had considerable effect on return on equity.

Data Envelopment Analysis Model has been used to investigate the efficiency of different ownership structured banks under intermediation approach and profit oriented approach. This study presents technical efficiency, pure technical efficiency and scale efficiency from 2005 - 2010. Under intermediation approach, the mean technical inefficiency of the commercial banks was 16.0% while the average pure technical and scale inefficiencies were 11.16% and 5.50%, respectively. The pure technical inefficiency of Nepalese commercial banks was higher than the scale inefficiency .This implies that pure technical inefficiency might be the main reason behind technical inefficiency in the Nepalese banking sector. Furthermore, the joint venture and domestic private banks were more efficient than public sector banks, which suffered managerial underperformance.

The Tobit model to estimate the impact of risk management factors on efficiency indicated that the capital risk (capital adequacy ratio), liquidity risk (credit to deposit ratio), profitable ratios (return on assets and return on equity) have influenced the efficiencies, however credit risk (non performing loan ratio) reduced the levels of the commercial banks efficiency. Commercial bank size had consistently inverse impact on technical, pure technical and scale efficiencies. With respect to their profit-oriented approach, the public sector banks most recently in the analyzed period were observed to perform relatively more efficient than joint venture and domestic private banks due to the large scale of branch networks.

In terms of the overall mean of the technical efficiency, the intermediation approach provided more efficiency scores than profit-oriented approach. Competition and new technology can all be reasons the banks are performing better as the intermediary function. Comparing the scores for different type of the commercial banks based on ownership provided mixed results. Under intermediation approach, joint venture banks were more efficient whereas public sector banks were found more efficient under profit-oriented approach. When comparing the individual banks, Nabil Bank Ltd and Standard Charted Bank Limited were more efficient under the both approaches. In addition, Agriculture Development Bank Limited, Kumari Bank Limited and Siddhartha Bank Limited were marginally efficient (more than 90%) only under intermediation approach. Thus, the bank with efficient under intermediation approach does not always mean that has better profitability performance.

With linking the financial variables effect and economic growth, the regression results for the period of 1975 - 2010 indicated that deposits and assets had significant impact on the economic growth of Nepal whereas loan and advances had insignificant impact on the economic development. Furthermore, the Granger-Causality test suggests that there was no causality with deposit, loan and advances and assets with the economic acceleration. It can be concluded that not only commercial banking performance but also other variables political stability and technology play the important role in the economic advances in Nepal. This study has also empirically investigated how bank risk management factors, technical efficiency under intermediation approach and technical efficiency under profit-oriented approach have effect on economic growth using Granger causality test. It was found that the relationship between risk management factors of the bank and its efficiency was positive and statistically significant. According to these findings, the banks with capacity of managing risk had more effect on economic growth.

Keywords*: Nepalese Commercial Banks, Financial Indicators, Efficiency, Economic Growth, Granger Causality

摘要

通常情况下，银行业占据了一个国家金融体系的绝大部分，尼泊尔的情况也是如此。同时信息和通信技术的飞速发展不仅为消费者提供了更多的银行产品，还促进了竞争，同时也使银行体系更为复杂，增加了风险和挑战。尼泊尔的第一家商业银行（Nepal Bank Limited），成立于 1937 年。而 2000-2010 年期间则是尼泊尔商业银行发展最快的时期，这一时期出现了很多私人银行。一方面，庞大的银行体系增强了人们的消费意识和储蓄习惯，也使人们对银行的要求更为苛刻和挑剔。另一方面，这也使情况复杂化，风险变大了。风险管理是银行成功的一个必然组成部分。有效的风险管理一直是银行安全业务的核心。因此，检查银行经营状况是否良好，是否持有充足的资金来抵御风险，这些都是很重要的。在全球经济竞争的背景下，需要生产力驱动的银行业特别关注其竞争对手的效率水平。

无论在发达国家还是欠发达国家，银行效率的研究一直都是一个热门研究领域。然而，在尼泊尔由于缺乏数据、缺乏科研院所及不完善的分析研究系统，现有关于银行效率的研究很匮乏。本研究的目的是分析尼泊尔的银行财务绩效和银行效率，以及银行财务指标和经济增长的联系。本次研究是第一次综合地利用财务比率分析和数据包络分析等多种方法，综合考察尼泊尔银行绩效和效率。这项研究进一步阐释了商业银行绩效是否显著影响了尼泊尔经济增长的问题。

用 CAMEL 模型对不同所有制结构化的商业银行的财务状况进行了研究。并选择了 18 家银行 2005-2010 年期间的财务状况，以分析确定它们的财务特征和财务状况的影响因素。结果表明，公有制银行的效率明显低于他们的同行，而国内私人银行的效率和外商独资（合资）银行的效率相当。

使用多元回归分析来估计的资本充足率、不良贷款比率，总贷款利息支出，净利息收益率，贷款存款比率对财务盈利能力（即资产收益率与银行股本回报率）的影响。结果表明，资本充足率、总贷款利息支出和净息差显著地影响了资产收益率，同时，资本充足率对股本回报率也有相当大的影响。

DEA 模型被应用于研究在中介法和利润导向的方法下不同所有制结构银行的效率，本研究提出了技术效率，纯技术效率，规模效率，并分析了 2005-2010 年间高效率的风险管理因素。根据中介法，商业银行的平均技术无效率为 16.0％，而平均纯技术无效率和规模无效率分别为 11.16％和 5.50％。由此可知，纯技术无效率对尼泊尔商业银行效率低的影响比规模无效率更大。此外，合资银行和国内私人银行的效率比国有银行的效率高，国有银行面临着经营业绩不佳和规模不合理的问题。

Tobit 模型用于评估计风险管理因素的影响。风险管理因素包含资本风险（资本充足率），流动性风险（贷款存款比率），盈利率（资产回报率和股本回报率）。盈利率影响了效率，但信贷风险（不良贷款率）降低了商业银行的效率水平。商业银行规模与技术效率，纯技术效率和规模效率成负相关性。就其利润为导向的做法，在分析时段内发现，由于国有银行大规模的分支机构网络，国有银行相对比合资企业和国内私人银行更有效率。

根据技术效率的总体均值而言，中介法的效率值比利润导向的方法的更高。竞争和新技术使银行的中介功能发挥的更好。然而，对于不同所有制类型的商业银行来说，竞争和新技术所起的作用也是不同的。在中介法下，合资银行比国有银行更有效率，而在利润导向的方法下国有银行比合资银行更有效率。在研究个别银行时发现，Nabil Bank Limited 及 Standard Chartered Bank Limited 在两种方法下效率都很高。此外，Agricultural Development Bank Ltd.，Kumari Bank Ltd 及 Siddhartha Bank Limited 只在中介法下具有高效率（90%以上）。因此，在中介法下高效的银行并不总是意味着具有较好的盈利表现。

在考虑了金融变量的影响和经济增长情况下，1975 年至 2010 年的回归结果显示，存款和银行资产对尼泊尔的经济增长有显著的促进作用，而贷款及借款对经济发展影响不大。此外，Granger 因果关系检验表明，存款、贷款、借款和资产同经济加速发展并无因果关系。由此可以得出结论，不仅商业银行绩效对尼泊尔的经济进步发挥了重要作用，而且诸如变化的政治局势和技术对尼泊尔的经济进步同样发挥了重要作用。本研究还实证分析了中介法下的银行风险管理因素和技术效率，以及在利润为导向的方法下，用 Granger 因果关系检验法检验技术效率

对经济增长的影响。结果发现，银行的风险管理因素和效率之间有显著的正相关性。根据研究发现，拥有管理风险能力的银行能更好地促进经济增长。

关键词：尼泊尔商业银行，财务指标，效率，经济增长，Granger 因果关系

Contents

Chapter 1 Introduction

This introductory chapter presents the background information of research work including inspiration of the research topic for the work documented in this thesis. Firstly, section 1.1 presents a brief but comprehensive background and significance of the research topic and research area. Afterwards, section 1.2 discusses problem statement and research questions while section 1.3 focuses on Nepalese banking sector-trends and practices, section 1.4 presents review of literature, section 1.5 confers objective of the study and section 1.6 converses anticipated contributions. Finally, section 1.7 presents main contents of the dissertation.

1.1 Background and significance

Financial sector is the backbone of economy of a country. It works as a facilitator for achieving sustained economic growth through providing efficient monetary intermediation. A strong financial system promotes investment by financing productive business opportunities, mobilizing savings, efficiently allocating resources and makes easy the trade of goods and services. Several studies [1-2] have reported that the efficacy of a financial system to reduce information and transaction costs plays an important role in determining the rate of savings, investment decisions, technological innovations and hence the rate of economic growth.

Banking has become an important feature, which renders service to the people in financial matters, and its magnitude of action is extending day by day. As like other developing countries, it is a major financial institutional system in Nepal [3]. A profitable and sound banking sector is at a better point to endure adverse upsets and adds performance in the financial system [4]. A competitive banking system promotes the efficiency and therefore important for growth, but market power is necessary for stability in the banking system [5]. The dexterous banks are better able to compete

because of their lower operational costs and can steal business away from less efficient banks.

The commercial bank holds a large share of economic activities of a country. The reliability of commercial banks has been treated as one of the essential factors everywhere since the past few decades. In order to draw global attention for dynamic investments in a competitive international business environment, healthy and efficient commercial banks are needed. The proficient commercial banks help to boost the effectiveness of the macroeconomic management [6]. Efficient commercial banks promote economic growth, efficiently mobilize and allocate resources, make capital more productive and create employment opportunities. There is increasing trend of commercial banks in terms of both quality and quantity all over the world. Although the present global financial situation is beneficial for the commercial banks, it presents obstacles and challenges for the commercial banking industry worldwide. Thus, it is important for commercial banks to improve efficiency and increase performance to remain competitive in order to survive the competition nationally and internationally.

The performance evaluation is the important approach for enterprises to give incentive and restraint to their operators and it is an important channel for enterprise stakeholders to get the performance information [7]. The performance evaluation of a commercial bank is usually related to how well the bank can use its assets, shareholders' equities and liabilities, revenues and expenses. The performance evaluation of banks is important for all parties including depositors, investors, bank managers and regulators. In order to probe how the banking system has performed and maintained the risk under the past economic and financial market conditions, a wide range of financial ratios are analyzed, covering the main development in income statements, balance sheet conditions, capital adequacy and asset quality. The best performing international banks help the Nepalese commercial banks to identify their weaknesses in order to improve their international competitiveness. The evaluation of a firm's performance usually employs the financial ratios method, because it provides a simple description about the firm's financial performance in comparison with previous periods and helps to improve its performance of management [8]. Moreover, the ratio analysis assists in determining the financial position of the bank compared to other

banks. Financial ratios such as return on assets (ROA), return on equity (ROE), non performing loan ratio (NPL), interest expenses to total loan (IETTL), capital adequacy ratio (CAR), net interest margin (NIM) and credit to deposit ratio (CDR) based on CAMEL Framework are related to capital, assets, management, earnings and liquidity considerations. These ratios would help to indicate the condition of capital, assets quality, management, earning and liquidity position of different types of banks.

The cavernous exploration of the relative efficiency of the commercial banks is very essential due to the increasing attention of the stakeholders to genuinely update with their performance and comparative efficiency. The concept of efficiency as a performance indicator began to formalize in the early works of Edgeworth [9], and recorded its empirical implementation in the book of Shephard [10]. The efficiency of the banks is heavily dependent on the financial deregulation, productivity and technology differences and the practices that serve a standard of the best practice. The financial discipline of commercial banks is also dependent on the element of foreignness. Hence, it is important to identify the whole backward linkage with the overall efficiency. According to Mester [11], bank's efficiency depends on the quality and associated risk on loans, and if they are not controlled, then the scores calculated may lead to erroneous conclusions. Deposit, loan and assets are the most important economic parameters are widely employed to analyze the efficiency of the banking system. More savings from the economy would make more funds available for investment.

Data envelopment analysis (DEA) developed by Charnes *et al* [12] as a nonparametric technique, has the advantage of being able to handle multiple inputs and outputs [13] to evaluate the relative efficiencies of multiple decision-making units (DMUs). The selection of inputs and outputs is crucial in DEA analysis and the commercial banks under intermediary approach accept deposits to use them for making loans and generating interest income [14-16]. As the growth of the commercial banks and the improvement in their efficiencies influence economic growth [17], understanding the determinants of the commercial bank efficiencies is helpful not only for the design of better management strategies but also general subject of interest for the investors, depositors and for the public concerns. However, Nepalese commercial banks have been always working towards the technological advances for efficient banking functions; the

commercial banks are facing growing competition due to the globalization of the financial systems [18-19]. Despite the significantly technological changes and growth of commercial banks in Nepal [19-20], there are no previous studies, which handled the subject of efficiencies of the commercial banking sector in Nepal.

Risk management is an inevitable component of successful banking. Effective risk management has always been central to safe banking activities. Hence, it is important to determine whether banks operate prudently and hold sufficient capital to support the risks. Linking financial sector with economic growth in an economy is a major concern among economists, financial analysts, researchers and policymakers. An extensive number of literatures suggest that financial institutions significantly influence the economic escalation of a country [21-24] due to the crucial role played by commercial banks in mustering huge amounts of deposits and the utilization of these deposits in investments. Several researches pointed out financial institutions are to be the best indicator of a country's real development potential [25-26].

In the context of Nepal, some previous researches have investigated the impact of financial sector and economic growth [3, 27]. In fact, they are regarded as key components of the economic development. Banking industry has much benefit over non-banking markets sector in the developing economies as like of Nepal with weak legal and accounting structures. In this environment, banks can be able to formulate firms disclose information and pay back their debts thereby facilitating spreading out and long-run development [28]. Those countries with a better financial system have a trend to increase its economic growth faster. The literatures suggest different ways of categorize financial system although the classification varies nation to nation. One of the popular ways is to segregate the overall financial system into bank-based and market-based (non-bank) financial system [29]. The bank-based theory emphasizes assets has the positive role of commercial banks in the economic progress. It has been suggested that banks can finance economic development in early stages, especially when the banks are unhampered by regulatory restrictions. Banks can also help to mobilize resources and reduce risk [30]. Studies examining the relationship between financial sector development and economic growth in Asia include those by Hsu and Lin [31] for Taiwan; Ang [32] for India and Malaysia, [33] Liu and Hsu for Taiwan, Korea

and Japan; [34] Perera and Paudal for Sri Lanka; [35] Jalil and Feridum for Pakistan and [36] Anwar and Nguyen for Vietnam. [31] using Taiwanese data for the period of 1964-1996, found that both banking and stock market development are positively related to short-run and long-term economic growth.

The Nepalese financial system categorized under bank-based system [27]. Nepal has established up comprehensive financial infrastructures such as commercial banks, development banks, finance companies, cooperatives, non-governmental organizations. Among the financial institutions, the common resource of supplies funds and the main source of financing to support the national economic performance are commercial banks [3]. Commercial banks are meant to speed up the rate of economic growth and development. In Nepal, the most of the people had neither the funds nor technical ability to invest in stocks and shares. It couples with the fact that they are reluctant to do so because of their preference for quick profits, which are readily available or obtainable elsewhere. However, other financial institutes also take share to meeting the financial needs of the economy. In term of economic growth, the annual average real economic growth rate of Nepal remained at around 5% in 1990s and further below at 4% during 2000-2010 [27]. Commercial banks play an important role in financial sector and accounts for more than 80% of the total assets and liabilities of the financial system [37], and demonstrated a positive relationship with the economic growth of Nepal.

1.2 Problem statement and research questions

1.2.1 Problem statement

Banking is a rapidly growing industry and Nepalese-banking system has experienced drastic and comprehensive reforms. The reform has achieved phased success, while challenges remain. Apparently, there is a need for an in-depth and comprehensive study to provide performance and efficiency assessment of the Nepalese commercial banking industry. Banking and Financial Statistics shows that there is more than NRs. 630880.8 millions of amount, deposited in various commercial banks of the country [37]. However, if the banks go bankrupt, what will happen to the depositors?

How will bankers get guidance to operate the banks more efficiently and profitably? Furthermore, every bank is demanding to enhance overall performance plus profits to occupy a better position in financial system. These all show the need to evaluation of the banks' performance is essential to understand their health and identify the key elements that have impact on the performance and efficiency of the banks. Performance evaluation is the important approach for banking industry to give incentive and restraint to their operators and it is an important channel for stakeholders to get the performance information. Though a number of studies related to financial and banking sector services, policies, liberalization and development have been reported, to the best of my knowledge, no investigation dealing with the macroeconomic determinant (such as RGDP) and bank specific factors including ROA, ROE, NPL, CDR and CAR has been conducted in Nepal.

1.2.2 Research questions

This investigation intends to fill the gaps in research as the first in-depth study in to the performance, efficiency and economic growth of the commercial banks in Nepal. In this connection, this study is able to deal with following issues:

1. What is the current state of the Nepalese commercial banks?
2. Has bank performance improved?
3. Which banks have performed better and why? Compare the banking performance among public sector, domestic private sector and joint venture banks.
4. How do efficiencies vary for individual commercial banks?
5. Whether or not does efficiency difference in the commercial banks due to its ownership? What are the effects of risk management factors on the efficiencies scores?
6. Whether or not commercial banking financial variables, risk management factors based on CAMEL framework and efficiencies reason to economic growth?

In order to assess the current state of the banking system and the performance of the banks, ratio analysis could provide an overall quantitative and qualitative assessment of the Nepalese commercial banking system. It could also evaluate bank performance and

distinguish well-performing banks from poor-performing ones to identify better governance structure. This analysis could also address the features of risking taking behavior using a set of financial ratios to represent capital risk, credit risk, managerial risk and liquidity risk and asset quality. In addition, data envelopment analysis is a suitable method to distinguish the best practice banks against which the relative performance of each bank is derived using a numerical efficiency score and ranking. Employing this method, different efficiencies can be estimated and can explore what are factors causing such irregularities. Tobit model is adopted to explore possible relationship between risk management factors that affect the efficiencies scores. By identifying internal factors that are expected to explain the difference in efficiency scores or ranks, bankers are able to address and adjust where necessary these factors in business strategies planning in order to catch up with the best performer. Finally, it is needed to empirically show the relationship between financial indicators and economic growth. By achieving these objectives, this study contributes to existing literatures on bank efficiency from the perspective of developing and transition countries. Despite the flourishing bank efficiency studies over the last several decades, the efficiency of the banking industry is sparsely researched. This study attempts to fill in this gap by providing a comprehensive and in-depth efficiency study for the Nepalese banking system.

1.3 Nepalese banking sector-trends and practices

Those countries with a better financial system have a trend to increase its economic growth faster. The literatures suggest different ways of categorize financial system although the classification varies nation to nation. One of the popular ways is to segregate the overall financial system into bank-based and market-based (non-bank) financial system [29]. The Nepalese financial system categorized under bank-based system [27]. The financial sector in Nepal lacked the important contribution made by the insurance system, social security and capital market, which made the banking sector more crucial to the economy because it represented the only source of finance.

1.3.1 Historical background of banking industry in Nepal

Nepal has established up comprehensive financial infrastructures such as commercial banks, development banks, finance companies, cooperatives, non-governmental organizations. Among the financial institutions, the common resource of supplies funds and the main source of financing to support the national economic performance are commercial banks [3]. Commercial banks presently hold a large share of economic activities of the country constituted 82.10% of total assets [20]. Stock market has been dominated by the commercial banks since a decade. The commercial banks are currently regarded as key drivers of financial institutions of Nepal. In Nepal, several commercial banks make a way to the business after the liberalization in 1980, deregulation, advancement in information technology and globalization [19]. Since then, many joint-venture banks (JVB) and domestic private banks (DPB) entered into the market. Figure 1-1 depicts that the commercial banks has continuously been increased. Although there is relatively a long history of evolution of the banking sector in Nepal, a formal and systematic capital market activities commenced from the early-1990s. There are presently 263 financial institutions among them 27 are commercial banks [37]. Of the 27commercial banks, 3 are public sector and 24 are privately owned (17 domestic and 7 joint-ventures).

1.3.2 Growth trend of Nepalese commercial banks

From Fig.1-1, it is easy to find out there is a significant growth in the number of commercial banks, authorized by Nepal Rastra Bank (NRB) in Nepal in the last two decades. At the beginning of the 1980s when the financial sector was not liberalized, there were only two commercial banks. After the liberalization and especially in the 1990s, financial sector has grown both in terms of the number of banks and financial institutions and in terms of their branches. This definitely has made a positive impact on the economic development of Nepal.
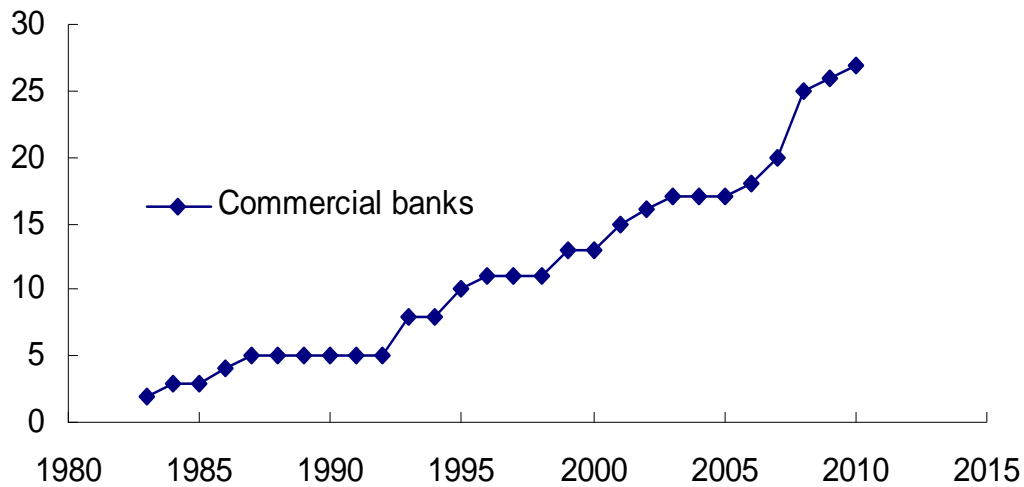
Fig. 1-1 Commercial banking trend of Nepal

Based on the ownership, the commercial banks in Nepal can be categorized into three groups as public sector banks, joint venture banks and domestic private banks.

Public sector banks

Public sector banks (PSB) have substantial shares in the total assets of the industry and have huge branch networks around the country. The public sector banks have also significant contribution on improving banking habit among the people at large and encourage entrepreneurship in both the urban as well as rural area. However, public sector banks are still the largest banks in all aspects from deposit and credit mobilization to the number of branches in operation; the public sector banks operating in Nepal are facing fierce competition with joint venture banks and domestic private banks in the prevailing market environment.

To improve efficiency and increase performance, the PSBs are now reorienting and redesigning their operational strategies and offering several innovative financial products like e-banking, ATM services, Mobile pay, SMS Banking, etc., to their customers. However, their success in retaining customers and meeting the aspirations of the regulators hinges upon how efficiently they utilize their financial resources in delivering financial services and products.

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    ┌──────────────────┐    ┌────────────────────────┐
    │ Commercial banks │    │ Development banks, Finance │
    │ (27)             │    │ companies, NGOs         │
    │ occupied 76.7%   │    └────────────────────────┘
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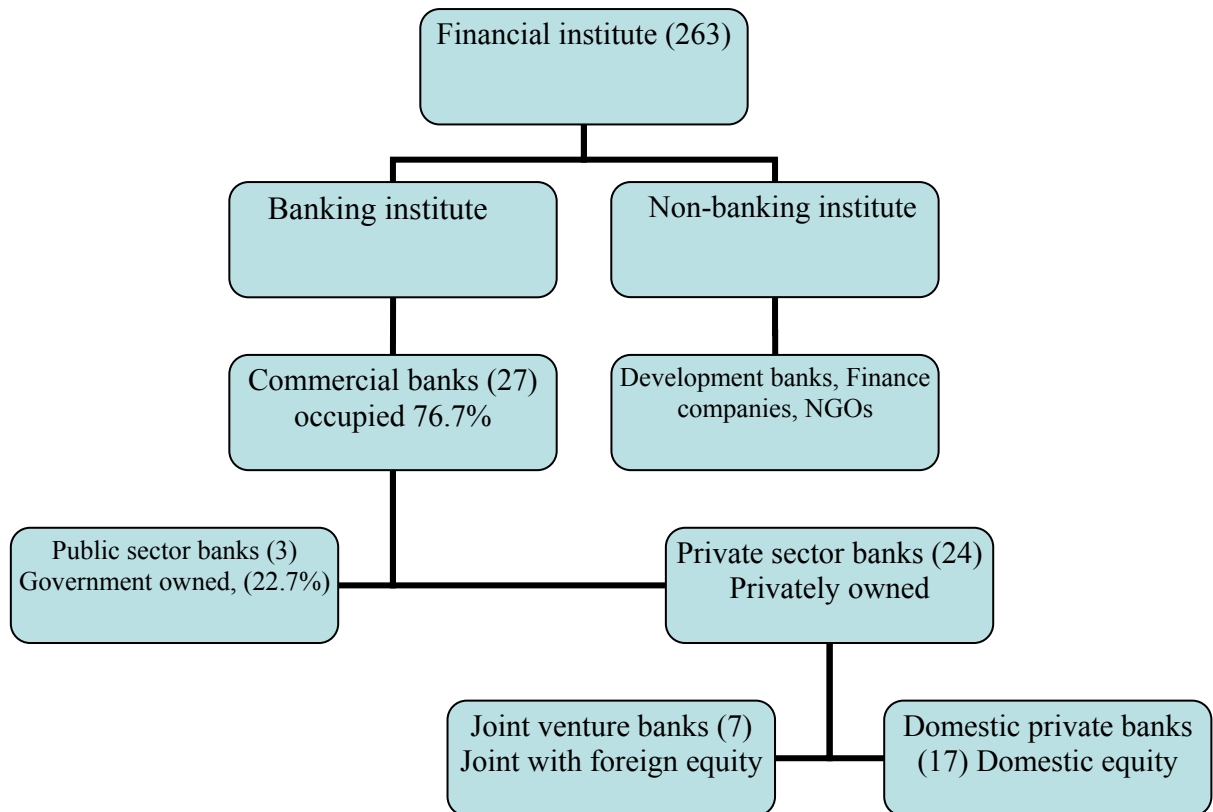
Fig.1-2 Financial structure of Nepal

Table 1-1 depicts the public sector banks of Nepal. Rastriya Banijya Bank (RBBL), Nepal Bank Limited (NBL) and Agriculture Development Bank Limited (ADBL) are government owned banks. Rastriya Banijya Bank Limited is the largest bank in terms of deposit mobilization in government ownership. The Government of Nepal owns 40.49 percent share in Nepal Bank Limited. Likewise, Government of Nepal now owns 53.5 percent shares of Agriculture Development Bank Limited that was initially established as a development bank with 100 percent government ownership and was upgraded to commercial bank in 2006. The financial health of public banks was very poor and thus a reform program was initiated in the above two government owned banks (except ADBL) under the financial sector reform project with the technical assistance of the World Bank and Department for International development.

Table 1-1 Public sector banks

SN	Name of banks	Year of operation	Partnership with	Remarks
1	Nepal Bank Limited	1937	Majority Government	Government is gradually offloading shares
2	Rastriya Banijya Bank	1966	Fully Government	
3	Agriculture Development Bank	1968	Fully Government	

Joint venture banks

The joint venture banks started to establish since mid-1980s. With the amendment of the Commercial Banking Act in 1984, entry barrier was relaxed to allow banking institutions operate in the private sector. They have foreign equity participation (along with domestic) and management with good name with international reputation, conducting banking business professionally. They are well mechanized and supervised by their respective home country supervisory authorities. The introduction of joint venture banks infused modern banking and financial technology and new financial instrument in the financial system. However, the spillover effect of their efficient management and modern banking skills was less in the domestic banks, as per expectation.

Among the joint venture banks, Nabil Bank Limited (NABIL) and Standard Chartered Bank (SCBL) are preliminary and larger banks. NABIL Bank (formerly Nepal Arab Bank) Limited was the first among joint venture banks, established in 1984, which was followed by Nepal Standard Chartered Bank (formerly Nepal Grindlays Bank) and Nepal Investment Bank (NIBL) formerly Indosuez Bank Limited in the subsequent years. Presently, Nepal investment bank turn into domestic private banks. Thus, until 1992, there were only three joint venture banks in the financial system.

Table 1-2 shows foreign equity participation of different joint venture banks. Those banks have brought in modern banking technology, financial instruments and financial services along with foreign capital investment. Introduction of joint venture bank has brought into revolution in the Nepalese banking system. The foreign participation in joint venture banks was mainly from India, United Kingdom, Bangladesh, France, Sri Lanka and Pakistan. Joint venture banks characterize the banks with foreign

participation in management with at least 50 percent equity participation. They have better experiences in banking as they have been operating internationally. They have been performing well as showing more efficiency over the years.

Table 1-2 Joint venture banks

SN	Name of banks	Year of operation	Partnership with	Remarks*
1	Nabil Bank	1984	National Bank Ltd, Bangladesh	Nepal Arab Bank
2	Nepal Standard Chartered Bank	1987	Standard Chartered, UK	Nepal Grindlays Bank
3	Himalayan Bank	1993	Habib Bank, Pakistan	
4	Nepal SBI Bank	1993	State Bank of India, India	
5	Nepal Bangladesh Bank	1993	IFIC Bank, Bangladesh	
6	Everest Bank	1994	Punjab National Bank, India	

* The name of banks are changed

Domestic private banks

Domestic private banks came in operation by late 1990s and early 2000s. There were seventeen domestic private banks in July 2010. Table 1-3 shows the domestic private banks of Nepal. They are managed and owned by private sector with or without foreign equity participation.

Table –1- 3 Domestic private banks

SN	Name of banks	Year of operation	Partnership with	Remarks*
1	Nepal Investment Bank	1986	Credit Agricole Indo-Suez, France	Nepal Indo-Suez Bank
2	Bank of Kathmandu	1995	Siam Commercial Bank Thailand	
3	Nepal Credit and Commerce Bank	1996	Bank of Ceylon	Nepal Bank of Ceylon
4	Lumbini Bank	1998	Initially established outside the capital	
5	Nepal Industrial and commercial Bank	1998	Initially established outside the capital	
6	Machhapuchhre Bank	2000	Established outside the capital	
7	Kumari Bank	2001	Initially established outside the capital	
8	Laxmi Bank	2002	Initially established outside the capital	
9	Siddhartha Bank	2002	Established outside the capital	

*The name of banks are changed

Since they are relatively new banks, they have the opportunity to start as 'fresh banks' without bad loans in their portfolios and with the possibility of adopting recent banking technologies during their inception. Most of them are relatively small in asset size as well as their networks.

1.4 Review of literatures

Previous banking literatures have examined different factors that correlate with different types of banks performance and efficiency. In general, comparing the bank performance and efficiency of different ownership structured banks has been researched most, because financial performance and efficiency has become the main subject all over the world. Furthermore, the finance and growth literature was initially interested in establishing empirically the link between financial development and growth. This section reviews previous studies on bank performance, efficiency and economic growth in different countries.

1.4.1 CAMEL model and financial soundness of banks

This section presents the review of the previous studies that determine the factors to affect the performance of the banks. The CAMEL Framework is the most widely used model [38]. The Central bank of Nepal (NRB) has also implemented CAMEL Framework for performance evaluation of the banks and other financial institutions. CAMEL stands for capital adequacy, asset quality, management efficiency, earnings performance and liquidity [39] and have used CAMEL model to examine factors affecting bank profitability with success [40]. In the literature, bank profitability is usually expressed as a function of internal and external determinants. The internal determinants could be termed micro or bank-specific determinants of profitability. The external determinants are variables that are not related to bank management but reflect the economic and legal environment that affects the operation and performance of financial institutions. A number of explanatory variables have been proposed for both categories, according to the nature and purpose of each study. The research undertaken

has focused on profitability analysis of either cross-country or individual countries' banking systems. The first group of studies includes [41-45] emphasis is on the bank profitability–business cycle relationship. Studies in the second group mainly concern the banking system in the US [46] or the emerging market economies [47]. All of the above studies examine combinations of internal and external determinants of bank profitability. The empirical results vary significantly, since both datasets and environments differ. There exist, however, some common elements that allow a further categorization of the determinants. Studies dealing with internal determinants employ variables such as size, capital, liquidity, asset quality, management quality and profitability. Size is introduced to account for existing economies or diseconomies of scale in the market. A positive and significant relationship between size and bank profitability was found [48]. It was suggested that the extent to which various financial, legal and other factors affect bank profitability is closely linked to firm size [44]. Similarly, it was also argued that the size is closely related to the capital adequacy of a bank [41] since relatively large banks tend to raise less expensive capital and, hence, appear more profitable. Using similar arguments, it can be linked the bank size – especially in the case of small to medium-sized banks – to capital and in turn to profitability [45, 49]. However, many other researchers suggested that little cost saving can be achieved by increasing the size of a banking firm [46]. The need for risk management in the banking sector is inherent in the nature of the banking business. Poor asset quality and low levels of liquidity are the two major causes of bank failures. During periods of increased uncertainty, financial institutions may decide to diversify their portfolios and/or raise their liquid holdings in order to reduce their risks. In this respect, risks can be divided into credit and liquidity risks. It was found a negative and significant relationship between the level of liquidity and profitability [43]. In contrast, an opposite result was noted [42]. It was appeared that the relationship between credit risk and profitability was negative [50]. This result might be explained by taking into account the fact that the more financial institutions are exposed to high-risk loans, the higher is the accumulation of unpaid loans, implying that these loan losses have produced lower returns to many commercial banks.

Turning to the external determinants of bank profitability, it should be noted that we could further distinguish between control variables, such as inflations, interest rates and cyclical outputs, and variables that represent market characteristics. The latter refers to market concentration, industry size and ownership status. A rather interesting issue is whether the ownership status of a bank is related to its profitability. However, little evidence was found to support the theory that privately owned institutions will return relatively higher economic profits [41]. In contrast, some previous studies reported that ownership status is irrelevant for explaining profitability [42-43]. The literatures describing the profitability determinants of the Greek banking sector is sparse. It was analyzed that bank- and market-specific profitability determinants for the 1993–1998 periods [51]. Their study represents one of the few attempts to account for profit persistence in banking, the empirical results suggesting that the Greek banking sector is imperfectly competitive. Market-specific variables such as concentration ratios and market shares were found to have a positive but insignificant effect on alternative measures of profitability. The effect of size is non-linear, with profitability initially increasing with size and then declining. Overall, the existing literature provides a rather comprehensive account of the effect of internal and industry-specific determinants on bank profitability, but the effect of the macroeconomic environment is not adequately dealt with. The time dimension of the panels used in empirical studies is usually too small to capture the effect of control variables related to the macroeconomic environment (in particular the business cycle variable). Finally, sometimes there is an overlap between variables in the sense that some of them essentially proxy the same profitability determinants. It follows that studies concerning the profitability analysis of the banking sector should address the above issues more satisfactorily, in order to allow a better insight into the factors affecting profitability. Thus, the research is expected to include all the factors affecting the bank's profitability, which may match with the results of some researchers and may differ from the others. Nepal, a developing country needs to improve the performance of the banking sector for economic development.

1.4.2 Guidelines of the central bank of Nepal

Banks are always faced with different types of risks that may have a potentially negative effect on their businesses. Sound risk management systems enable managers of banks to take risks knowingly, reduce risks where appropriate and strive to prepare for a future, which by its nature can not be predicted in Nepal. As a regulator, the central bank of Nepal (Nepal Rastra Bank) has been continuously issuing various policies, guidelines and directives, to the licensed institutions, in line with international best practices and norms.

For the purpose of capital adequacy measurement, Nepal Rastra Bank initially fixed the core capital at the level of 4.5 percent of the risk-weighted assets and total capital at the level of 9 percent of risk weighted assets of the commercial banks. For the current FY2009/10, the mandatory levels of core capital and total capital are 6 percent and 10 percent of risk weighted assets of the commercial banks. But Nepal Rastra Bank has strictly directed all the commercial banks that the amount of the supplementary capital should not be in excess to the amount of the core capital (NRB, 2010). The quality of assets held by a financial institution depends on exposure to specific risks, trends in non-performing loans, and the health and profitability of bank borrowers. NRB has directed the commercial banks in regards to the concentration of the loan. Any licensed Financial Institute can grant the fund base loan to a single borrower or borrowers related to the same business group up to the 25 percent of its primary capital. In the same vein, it can provide the non-fund base loan up to 50 percent of its core capital [52]. Similarly, it has directed Financial Institutes to classify the loans into performing loan and nonperforming loans. The loans that are not due and 3 months past due fall in the class of performing loans/performing assets and others do in the non-performing loans. Further, non-performing loans are classified into three groups: substandard, doubtful, and bad debt/loss. Commercial banks have to make 1 percent provision for pass loan/performing loan, 25 percent for substandard loan, 50 percent for doubtful loan and 100 percent for bad loan [37]. Nepal Rastra Bank uses return on total assets as an indicator of profitability of a commercial bank. In addition, it uses the absolute measures such as interest income, net interest income, non-interest income, net

non-interest income, non-operating income, net non-operating income and net profit, to evaluate the profitability of a commercial bank. For the purpose of measure liquidity risk, Nepal Rastra Bank uses total loan to total deposit ratio, cash and equivalents to total assets ratio, cash and equivalents to total deposit ratio, NRB balance to total deposit ratio to measure the liquidity position of commercial banks in the course of the performance evaluation of commercial banks.

1.4.3 Efficiency of commercial banks

The efficiency of a commercial bank evaluates the performance of banks by determining the difference between the observed and actual outputs. The benchmark is the optimal quantity of either input or output given the type of approach used. Output quantity can be input oriented or output oriented given the range of efficiency between 0 and 1 [53]. The perfectly efficient equates to one while the inefficient scores zero. Efficiency is a relevant concept and it is measured relative to other banks in same year and to same bank in any other specific year. Efficiency is usually measured against a specific motive. It was analyzed that the efficiency against the banking reforms in process [54]. The efficiency was measured against each other and the efficiency scores were indicators of impact of government policies on banking sector [53]. Efficiency is a relatively newer concept as most of the work is done in latter half of last century. It has major merits over the traditional ratio analysis; one being no requirements of benchmarks for each ratio [55]. Furthermore, this study state that ratio analysis tends to take averages and long-term performance cannot be separated from one in short term so it is preferred at all levels.

1.4.3.1   Evidence on bank efficiency in developing countries

It was examined that the effects of financial liberalisation on the technical efficiency of Turkish commercial banks, using the nonparametric DEA approach. It was found that the technical efficiency of the Turkish banks has improved by 10%, on average after the implementation of the liberalisation programme implemented by the

Turkish Government and which aimed to create a more competitive banking environment. When the study decomposes overall technical efficiency into pure technical efficiency and scale efficiency, found that most of the Turkish banks are operating under constant returns to scale and that technical inefficiency is mainly attributable to low pure technical efficiency[56]. The stochastic frontier approach was used to estimate the cost and "alternative" profit efficiencies of Turkish banks [57]. The average cost and profit efficiencies over the years studied range from a low of 84% up to a maximum of 90%. The correlation coefficient between the cost and profit efficiencies is poor (only 19%), suggesting that high cost efficiency does not necessarily lead to high profit efficiency. It was also examined the impact of bank size, corporate control and corporate governance and ownership on cost and profit efficiencies. It was suggested that domestic private banks are much more efficient than state-owned banks and smaller banks tend to be operating more efficiently than larger banks [57]. The stochastic frontier approach was employed to examine the cost efficiency of Korean banks over the period from 1985 until 1995 [58]. The authors pointed out that during the period from 1960 until 1980, the Korean government had a policy of consistent interference in the operations of banking and financial institutions and this, in turn, had an adverse impact on the efficiency of the banking system as well as on resource allocation throughout the Korean economy. However, after 1980 the Korean government began to privatize banks and deregulate its financial sector in order to alleviate the problems caused by governmental interference. It was presented that the average cost efficiency score over the period from 1985 until 1995 was 89% and that there was no significant efficiency improvement over this sample period [58]. In the second stage regression to identify the key determinants of Korean banking efficiency, it was observed that the banks with higher rates of asset growth, fewer employees per value of assets in place, larger amounts of core deposits and operating nationwide tended to be more efficient. In addition, it was also found that efficiency levels were positively correlated with the level of foreign equity ownership but negatively correlated with the level of government ownership [58]. Using a stochastic cost frontier approach, the banking efficiency was investigated in the four Asian counties (Indonesia, Malaysia, the Philippines and Thailand) over the period from 1989 until 1996 [59]. The

average cost efficiency of these Asian banks deteriorates over this sample period. It suggested that the deterioration in efficiency over this period might have contributed to the Asian financial crises in 1997 [59]. Moreover, the results show that there are significant differences in banking efficiency across the four Asian countries. On average, Thai banks are the most efficient, followed by Malaysian banks, Indonesian banks, whilst Philippino banks are the least efficient [59]. It was also found that privately owned banks are more cost efficient than state-owned banks and that larger bank tend to have higher cost efficiency scores than smaller banks. A comparative analysis of the evolution of the efficiency of commercial banks in India and Pakistan was done for the period from 1988 until 1998 employing two alternative DEA specifications (loan-based and income-based models) [60]. It was found that the overall technical efficiency of both Indian and Pakistani banks have improved gradually over the sample period. In the case of Indian banks, this improvement is attributed to both increases in pure technical and scale efficiencies. For Pakistani banks, however, the increased overall technical efficiency is primarily attributed to an improvement in scale efficiency. Moreover, comparing the results of the loan-based and income-based models, they found that the banks are relatively more efficient in generating earning assets than in generating income. The variation in the estimated efficiency scores over the period of the analysis was explained by correlating the efficiency scores obtained with bank level factors such as ownership structure, market share and the capital to total assets ratio [61]. At the bank level, the private banks are more cost efficient than state-owned banks and those majorities of the foreign-owned banks show the most favorable cost efficiency scores amongst the different types of private banks [61]. It suggested that one way of increasing the efficiency of the East European banking sector is for majority-owned foreign banks to take significant ownership interests in state-owned East European banks. It was used a stochastic cost frontier approach to investigate the efficiency and total factor productivity of Indian banks during the period from 1986 until 2000 [62]. It was employed a one-step estimation procedure to estimate the cost efficiency of the Indian banks and then decomposes total factor productivity into technical change, scale effect and efficiency growth [62]. It was found that banks have improved their performances during the sample period in term of cost efficiency. His results suggest that deregulation

in the Indian banking sector has achieved the desired effect of increasing Indian banking efficiency. It was also investigated the role of ownership in determining cost efficiency. The results show that foreign banks exhibit the worst performance in terms of both cost efficiency and productivity growth when compared with Indian state-owned banks and private domestic banks. It was investigated that the x-efficiency and scale efficiency of commercial banks in the Ukraine over the period from 1998 until 2003 using the DEA technique [63]. They estimate both a common efficiency frontier for all banks and separate efficiency frontiers for each bank size group (small, medium and large). They found that efficiency scores are significantly correlated between the common and separate frontier results. Their results also showed that the average technical efficiency was only 47% and that the dominant source of inefficiency was driven by poor management decisions (pure technical efficiency) rather than there being any scale inefficiencies. They also examined the impact of size and ownership location factors on the efficiency of the Ukrainian banking sector. Here they found that large banks tended to be more pure technically efficient but less scale efficient than small banks. Moreover, the results suggest that joint venture banks with majority foreign ownership appear to be the most efficient and that a bank's geographic location is also an important determinant of its relative efficiency.

1.4.3.2   With specific reference to Nepal

A lot of work is done in the efficiency analysis at international level but negligible work is conducted in at national level due to newness of technique and complicated procedures involved determining the inputs and outputs and then choice of scale and technique also result in the efficiency scores to be more sensitive. Only one work is conducted in Nepal includes Gajurel[64]. This study used data envelopment analysis to evaluate the cost and profit performance of banking sector.

1.4.3.3   Financial sector development and economic growth

The relationship between banking sector and economic growth has been extensively debated and investigated over the last two centuries. Literatures in this field have been mainly focused on understanding links between banking sector and economic growth. It was opined that banks are important to the economy because they influence the level of economic activities in two ways, namely: by expansion and contraction of loans and investment. These activities alter the nation's money supply, and by extension affect the size of loans, influence what is produced, how much is produced and where it is produced [65]. Similarly, it was also identified that banks as agents of economic development. This is because they invest directly in the economy (e.g. by buying the shares of other companies) and grant loans to others for investment and purchase of securities [66]. Several other authors [67-69] have highlighted that the savings mobilized by banks are utilized by the deficit economic unit for investment which improves capital accumulation, expands output and invariably leads to economic growth.

It was examined that the long run relationship between financial development indicators and economic growth in Nigeria over the period 1970-2010 using the Johansen and Juselius [70] approach to co integration and Vector Error Correction Modeling (VECM) [71]. The findings of the studies revealed that in the long-run, liquid liabilities of commercial banks and trade openness exert significant positive influence on economic growth, conversely, credit to the private sector, interest rate spread and government expenditure exert significant negative influence. It was presented that the effect of banking sector reforms on economic growth in Nigeria by using the data 1999-2009 [72]. Variables used for the study are interest rate margins, parallel market premiums, total banking sector credit to the private sector, inflation rate, inflation rate lagged by one year, size of banking sector capital and cash reserve ratios. The results indicate that the relationship between economic growth and other exogenous variables of interest rate margins, parallel market premiums, total banking sector credit to the private sector, inflation rate and cash reserve ratio show the negative and insignificant. Hence it is suggested that criteria which encourage banking sectors to give more capital or start huge amount of lending to the individuals by minimize cash reserve ratios which

is not suppose to be motivated factors for economic growth if the borrowing capacity that due to these criteria. It will not surpass to the growth of private sector in the form of longer term finances. To find out the solution of this problem, the financial policies should consider to reform and enforce the borrowing in small industries with proper regulatory policies and against secure type of collaterals and confirmation of guaranteed repayment of finances given to them.

It was investigated that the Globalization and its effects on the Banking System performance in Egypt by using descriptive quantitative analysis method, using published data and Information's in the reports of the Central Bank of Egypt, besides the books and scientific periodicals in this field [73]. Variables used in this research are Globalization & Mergers. The Result was shown that financial growth process aimed at enhancing the efficiency of the national economy through management style and approach in the private and government sectors. These sectors achieved greater financial resources available to the government due to conduct a sale in some units owned and lead to the retreat of the responsibility the state budget for financing investments, and increase productivity the quantity and quality of the availability of better methods of management. It was observed that the relationship between financial sector and economic growth by using an empirical method, namely Fixed-effects panel model techniques by means of following data variables: Difference between lending and deposit interest rates as percentage points, ratio of bank credit to private sector to GDP, reform index, annual consumer price index as percentages [74].

It was investigated that the effects of conventional interest rates and rate of profit on funds deposited with Islamic banking system in Malaysia by using 'Adaptive Expectation Model' to measure the effects of rate of profit declared by Islamic banks on the level of deposits placed by their customers [75]. Data variables are saving deposits, Interest-free, Rates of Profit, results shows that relationship between the amounts of deposits placed in the Islamic banking system in Malaysia and returns given to these deposits hence which are guided by the profit motive. It was recommended that these doctrines require that Muslims should not placed profit maximization as the sole factor in establishing relationship with Islamic banks. It was investigated that the determinants of interest spread of the banking industry in Pakistan [76]. They opined that that there is

no evidence of interest spread which influence the performance factors of banking industry that also includes the other financial sectors. Previous study was evaluated the banking reforms in Serbia by using survey data results [77]. The study used the approach of pre and post performance through many factors, which are relevant to reformation of banking systems are reliability and management quality responsiveness in Serbia banking systems. Qualitative technique has been used for results, however this article also concluded the different problems and challenges face by the current system and found out the result that is positive. It was investigated that the effects of market-based financial sector reforms on the competitiveness and efficiency of commercial banks, and economic growth, in Zambia by using the variables such as Macroeconomic per capita GDP and inflation [78]. Further, by using an endogenous growth model in which industrial production is a key for GDP growth. Hence, the results showed that structure adopted in second stage (maximize the regulatory and monitory, payments and remittances, and other financial operations of banking sector), next stage has been driven of a comprehensive financial sector development regulations, which had significant and positive effects on banking cost efficiency. Further in this study, they found that bank overall cost efficiencies, financial depth, stage two and stage three in which financial sector reforms has been discussed, the concluded that degree of economic freedom, and rate of inflation were significantly impact on economic growth. The stage two policies and the inflation rate have negative effects, however the remaining of the variables have positive results on economic growth. It was empirically investigated that what is impact of financial reforms on assertiveness and growth efficiency of the banking industry, as well and found the long-term and short-term impact on economic growth in Egypt during the period of 1992 to 2007 [79]. The study suggests that the reforms have a positive and significant effect on assertiveness and growth efficiency in Egypt banking industry. They also found the result which shows that government banks are generally well efficient than private banks and foreign banks which are less aggressive than domestic banks. The total inefficiency of Egyptian government banks is approximate 30 percent, which is comparable to different banks mentioned in report of African countries banking sectors. Hence, it is concluded that there is a relation exist is significant in other financial industry and the banking sectors

productive efficiency and economic growth and suggest in the short run but will not support in the long run. Overall, the results support that reformation in financial sectors particularly in banking sectors in Egypt would be continued process for growth in economy. It was observed that the relationship between commercial banking performance and economic growth in Qatar with use of the variables of bank profit, GDP, foreign interest rates, government revenues, government expenditures and banks equity by using the regression analysis model and techniques have been used [80]. Furthermore, stability tests for structural stability and granger causality experiments in which granger causality tests also use to analysis on all variables and other variables are suppose insignificant at acceptable. Hence, the results found out that predictions through variables and model are highly effective and responsible for economic growth. The study suggests that the commercial banks are playing a large role in economic growth because of the profit making organizations. In addition, among all the variables on GDP and banks equities were significant and with the positive signs, in the model equation found to be stable. Thus, the financial advisors should be analysis through associations according to monetary policies and the financial factors and economic variables, the author further suggested that the model also supports to check the relation through financial factors and other countries economic growth of that country. It was empirically investigated the relation in the bank performance and economic growth at the state level. In their studies they developed a review for regional credit that explain, one of the reason which is data cost effects the banking sectors and can also influences economic performance by development ability to funds local investments [81]. Further, the model supports that government banking sectors facing problems of economic criteria where by not well financially sound, and same that no evidence need to link in the sector which is financial established. The data have been used to find relation of this credit analysis model for the period of 1983 to 1990. The data consist of regional level and find the output of such channels which particularly, local focus on government banking sectors, further the results explain the real individual income growth in the country in consideration with NPL's which is out of the average share.

It was investigated that the relative merits of banking sector vs. capital market in promoting economic growth in Nepal [27]. The empirical results using Johansen's

cointegrating vector error correction model based on aggregate annual data from 1993 to 2010 suggest that banking sector plays a key role in promoting economic growth in Nepal. Research on the financial sector and economic growth has gained some attentions, but most of the researchers preferred monetary aggregates to GDP and economic growth but no studies reflect on contribution of particular commercial banks risk factors based on camel model and economic growth in Nepal.

1.5 Objectives of the study

This research work has been aimed to investigate the following burning questions:

- To demonstrate the strength of risk management in banks and identify the key elements that has impact on the performance of commercial banks.
- To examine the bank efficiency performance of the Nepalese commercial banks and to identify factors that contributes to efficiency gains.
  - o To find out efficiency under intermediation approach
  - o To find out efficiency under profit oriented approach
- To link financial indicators with economic growth
  - o Relationship between Deposit, Credit (Loan and advance) and Assets with economic growth.
  - o Relationship between risk factors (ROA, ROE, CAR, CDR, NPL, Technical efficiency under intermediation approach and profit-oriented approach) with economic growth.

1.6 Anticipated contributions

1. The empirical results implied that the Nepalese commercial banks should concern capital risk seriously as capital adequacy ratio impinged on both profitability ratios-return on assets and return on equity. It was also investigated that the non-performing loan ratio was negative and insignificant with the both profitability ratios due to poor asset quality or high non-performing loans to total asset. The commercial banks should

maintain low non-performing loan in order to obtain higher profit than their counterparts should.

2. In terms of credit to deposit ratio, which is proxy for liquidity risk, implied that some larger banks namely NBL (42.9%), RBBL (51.27%) and SCBL (43.14%) all have been operating with lower ratios. In order to increase its liquidity and profitability position, it should improve the quality of loans and investments. The bank should explore new ideas of client's satisfaction and initiate different services to customers.

3. In addition, main contribution of this study was to confront the efficiency scores generated by the two major approaches for measuring banking used in the literatures (the intermediation approach and the profit-oriented approach). The results indicated that the choice of an intermediation approach or a profit-oriented approach for measuring banking activity could significantly influence the generated average levels of the technical efficiency.

4. The data envelopment analysis under intermediation approach resulted in the technical efficiency of the Nepalese commercial banking industry was poor due to inadequate inputs utilization. However, the degree of technical efficiency for the commercial banks was lower than the degree of scale efficiency, which indicates that a portion of the overall inefficiency was due to producing below the production frontier rather than producing on an inefficient scale. Concerning the ownership, it was found that the public sector banks were less efficient than joint venture banks and domestic private banks due to the high overhead costs, political interventions and poor managerial management. The public sector banks are still working with traditional approach and so they are needed to adapt global innovative advances in their business.

5. Under the intermediation approach, private (joint venture and domestic) banks were considerably more efficient than public sector banks. Due to the profit rates given to deposits by private banks were higher than those of public banks, they attracted large deposits. On the other hand, the lower efficiency of public sector banks due to their poor

management of deposits, they could not utilize them efficiently in investment projects. In contrast, under the profit-oriented approach, public sector banks were technically efficient in average. Due to the public sector, banks were obliged to provide more direct credit facilities and subsidized-banking services to several less-privileged areas. Due to this large expansion in public banks, public sector became more efficient than private banks under the profit oriented approach.

6. The data envelopment analysis for the efficiencies evaluation furthermore indicated that the Nepalese commercial banks are heterogeneous, with some banks performed well for the intermediary role while others on profitability role. Higher operation costs restricted to reap the benefits of economies of scale for the most of the small private sector banks and consequently they are inefficient under profit-oriented approach. Only two banks, namely Standard Charted Bank Ltd and Nabil Bank Ltd (both are joint venture banks) were determined full efficient under the both approaches.

7. The empirical results put forward that the entry of large number of private sector banks in Nepal influenced financial sector positively as well as economic growth due to better service, access of information, performance and efficiency. The underdeveloped financial system in Nepal and consistently inverse impact of Size on the efficiencies of the Nepalese commercial banks implied that the central bank of Nepal should also be careful about encouraging banks to become very big.

8. The previous studies focused on the relationship between ratio of monetary aggregates (such as M1, M2 or M3) to GDP, or credit to private sector to GDP ratio and economic growth but no studies reflect on contribution of particular commercial banks performance and economic growth in Nepal. Furthermore, it has been taken into consideration the strong state involvement in the commercial banking sector and assessed how it might affect the economic growth. The results of Granger Causality models reveal that growth in the economic activities in Nepal (represented by real gross domestic product) did not seem to granger cause the deposit, loan and advances and assets due to extremely small size of market. Being highly concentrated in urban areas,

particularly in Kathmandu valley and that their contribution to economic growth, is limited owing to a lack of financial depth. Most of the commercial banks are unable to efficiently transforming deposit into loan as well as utilizing granted loan for productive purposes.

9.   This study has also empirically investigated how banks' risk management factors, technical efficiency under intermediation approach and technical efficiency under profit-oriented approach have an effect on economic growth in the term of real gross domestic product. As return on assets, return on equity, capital adequacy ratio non-performing loan, efficiency under intermediation approach and efficiency under profit-oriented approach were statistically significant; the more efficient banks with capacity of managing risk had more effect on economic growth.

1.7 Main contents

The main objectives of this study are to examine the financial and bank efficiency performance of the Nepalese commercial banks and to identify factors that contribute to efficiency gains and linkage of commercial bank efficiency performance with economic growth.

First, this study will assess the current state of the Nepalese commercial banking system using conventional financial ratios analysis that is based on CAMEL model. The performance evaluation of a commercial bank is usually related to how well the bank can use its assets, shareholders' equities and liabilities, revenues and expenses. The performance evaluation of banks is important for all parties including depositors, investors, bank managers and regulators. The assessment provides comprehensive information of the Nepalese commercial banking system for the period spanning from 2005 to 2010 when the banking system experienced the most drastic reforms. Borrowing financial indicators from the macro-prudential analysis framework, the performance and financial condition of Nepalese commercial banking is analyzed in terms of the profitability ratios Return on assets and Return on equity, Capital adequacy ratio, Non-performing loan ratio, Interest expenses to total loan, Net interest margin

ratio and Credit to deposit ratio. In addition, the impact of these ratios on profitability ratio namely return on assets and return on equity have been investigated using ordinary least square. Any favorable or downside trends were investigated in depth to reveal underlying reasons and problems. The main purpose was to identify strengths and weaknesses of the Nepalese commercial banking system from a financial perspective. It means it has been demonstrated the strength of risk management in banks and identified the key elements that have impact on the performance of commercial banks in this study.

Evaluating commercial bank performance in term of technical efficiency to examine whether the performance has improved after more than two decades of unremitting reform efforts. Nepalese banking sector is often criticized for having too many banks for a small economy, with a visible gap among the banks in terms of assets size. And, therefore the option of merger has been introduced by the Nepal Rastra Bank to reduce the number of banks and make the merged banks stronger than they were individually. The huge gap in the size of the banks calls for the necessity of merger immediately. The size of the banks can give some indications on which banks should be merged and how can a strong bank be formed. The merger could be successful, if many banks of equal size be merged and made a competitive one. As a result, to examine the technical efficiency of different ownership structured commercial banks in Nepal the intermediation approach was used keeping in mind the commercial banks of Nepal and the supporting literatures encouraging us to use this approach. Therefore, this study have selected the following inputs and outputs- loans and interest income as outputs and deposits and interest expense as the inputs to measure the technical efficiency.

In addition, the profitability approach, which is a relatively newer approach adopted to find out the technical efficiency, pure technical efficiency and scale efficiency using interest expenses and loan loss provision as inputs and three outputs - net interest income, commission income and other operating income.

In order to further investigate the effects of risk management factors on the technical, pure technical and scale efficiencies, this study followed with a Tobit model. The technical, pure technical and scale efficiency scores obtained from DEA evaluations have been used as the dependent variable in the Tobit model. The dependent

variable takes value equal to 0 for inefficient banks and value equal to 1 when bank is efficient. Thus, the dependent variables turn out to be a binary variable having values either 0 or 1. Tobit regression is useful when observed outcome is restricted to be binary and takes the values 0 or 1. Thus this study, used Tobit regression. The Return on Assets, Return on Equity , Capital Adequacy Ratio , and Credit to Deposit Ratio , Non-Performing Loan Ratio , Size and OWN (Ownership) have been used as independent variables. All the variables were measured in percentage except Size, which was considered in Nepalese Rupees and for ownership. we used dummy variable-0 if the bank is owned by public sector banks otherwise 1.

The operation of the banking system can have a key impact on economic growth and the stability of the economy. It affects economic growth indirectly through its effect on the efficiency of intermediation between the savers and final borrowers of funds; most governments implement economic policies through banks. Since the banking sector is the biggest financial sector in the most countries, this research focuses on commercial banking sector.

This study addresses the question of whether or not commercial banking financial indicators in Nepal reasons to economic growth. In order to answer this question, the present study focuses on analyzing the relationship between financial variables (deposit, loan and advances and assets) with economic growth. Furthermore, it has been studied the linkage of financial risk factors (capital adequacy ratio, credit to deposit ratio, non-performing loan ratio, return on assets and return on equity), technical efficiency under intermediation approach and technical efficiency under profit oriented approach with economic growth. Build a model for the relationship between commercial banking financial indicators and economic growth and discussing the contribution of commercial banks to growth; this study have used Augmented Dickey Fuller, Ordinary Least square and Granger causality tests.

Chapter 2 Theoretical framework

The main objective of this chapter is to introduce the theoretical framework related to CAMEL Framework, Technical efficiency, pure technical efficiency, Scale efficiency and economic growth. First, we introduced the CAMEL Model and its components and then investigated the relationship of bank specific factors and performance. Secondly, theoretical framework of Data envelopment analysis has also been presented. Thirdly, we described the theoretical overview of financial sector and economic growth as well.

2.1 Theoretical prescription of CAMEL Model

Banking is a complex job made more complex by the fact that it runs on public money. Hence, the success of any bank depends largely on its ability to take prudent decisions at the backdrop of secure and reliable services and sound operational practices. Sound risk management strategies can be implemented by integrating effective bank-level management, operational supervision and market discipline. It is also imperative for the banks to update their risk management practices in accordance with Nepal Rastra Bank regulations and sound international practices. Consumers today are more demanding than they were a decade ago. Hence, the trend and scope of commercial banking has been changing rapidly. Competition is getting stiffer thus warranting banks to enhance their competitiveness and efficiency by improving profitability, service quality, customer responsiveness and public accountability. Similarly, the banks also require adopting the prudent and self-regulating practices for achieving banking efficiency, reducing overall risks and ensuring the safety of public deposits. Banks also need to encourage healthy competition and avoid risky behavior and practices for long-term sustainability. This can be attained by understanding the volatile nature of the business and working collectively for uplifting public confidence in the banking system.

Though some alternative bank performance evaluation models have been proposed, the CAMEL framework is the most widely Basle Committee on Bank Supervision and International monetary fund [38] recommends used model and it. In the early 1970s, federal regulators in USA developed the CAMEL rating system to help structure the bank examination process. The five factors are represented by the acronym "CAMEL". The five factors examined is as follows: C- Capital adequacy, A-Asset quality, M-Management quality, E-Earnings and L-Liquidity. In 1979, the Uniform Financial Institutions Rating System was adopted to provide federal bank regulatory agencies with a framework for rating financial condition and performance of individual banks [82]. Since then, the use of the CAMEL factors in evaluating a bank's financial health has become widespread among regulators. The dynamism of the global financial environment requires Nepalese banks and financial institutions to support their operations with more robust tools and skills in order to mitigate risks arising from the ever-evolving financial landscape coupled with an unprecedented development of technology. As such, the banks are obliged to adopt adequate and appropriate risk management practices and promote self-regulated internal environment. Effective risk management has always been central to safe banking activities.

2.1.1 Components of CAMEL Model

Banks and other depository institutions are evaluated by the appropriate regulators on six major areas, depicted by the CAMELS acronym. Nepalese Commercial banks are using five components CAMEL. Each component is discussed below:

2.1.1.1   Capital adequacy ratio for capital risk

The first component, capital adequacy ultimately determines show well financial institutes can manage with shocks to their balance sheets. Thus, it tracks capital adequacy ratios that take into account the most important financial risks - foreign exchange, credit, and interest rate risks - by assigning risk weightings to the institution's assets. For the purpose of capital adequacy measurement, bank capital is divided into

Tier I and Tier II. Tier I capital is primary capital and Tier II capital is supplementary capital. In Nepalese context, Tier I (core/primary) capital includes paid-up capital, share premium, non-redeemable preference share, general reserve fund, accumulated profit, capital redemption reserve, capital adjustment fund, and other free reserve. Amount of the goodwill, fictitious assets, investment in the financial instruments issued by an organized organization in excess to the limit specified by Nepal Rastra Bank, and investment in the financial instruments issued by the organizations having the own financial interest is deducted from the sum of all elements of the primary capital to arrive at the core capital. Similarly, Tier II (supplementary) capital comprises of general loan loss provision, assets revaluation reserve, hybrid capital instruments, subordinated term loan, exchange equalization reserve, excess loan loss provision, and investment adjustment reserve. Thus, the total capital of commercial banks is the sum of core capital and supplementary capital [52]. Leverage ratio can be used to measure the capital adequacy of a bank. This is the ratio of bank's book value of core capital to the book value of its assets. The higher ratio shows the higher level of capital adequacy. The U.S.A. Federal Deposit Insurance Corporation Improvement Act of 1991 has fixed the five target zones: i. 5 percent and above ii. 4 percent and above iii. under 4 percent, iv. under 3 percent, v. 2 percent and less, of leverage ratio. The leverage ratio falling in the first zone implies that bank is well capitalized. Similarly, the leverage falling in the second zone shows that bank is adequately capitalized. The leverage falling in the last three zones indicates that bank is in adequately capitalized and regulators should take prompt corrective action to bring the capital to the desirable level [83]. The leverage ratio stated in the foregoing discussion is simple capital to assets ratio. In other words, assets are not risk adjusted. The 1993 Basel Accord enforced the capital ratio to risk adjusted assets of commercial banks. According to this accord, core capital must equal to or exceed 4 percent of the risk weighted assets of the commercial banks. Similarly, the amount of the supplementary capital should not exceed the amount of the core capital and the total capital must equal or exceed 8 percent of risk weighted assets [83].

2.1.1.2   Asset quality for Credit performance

Credit performance assesses the risks associated with the bank's asset portfolio. The level of the credit risk depends on the quality of assets held by an individual bank. The quality of assets held by a financial institute depends on exposure to specific risks, trends in non-performing loans, and the health and profitability of bank borrowers-especially the corporate sector. The reason of bank crashes find that asset quality is a statistically significant predictor of insolvency and that failing banking institutions always have high level of non-performing loans prior to failure. We can use a number of measures to indicate the quality of assets held by financial institute. Asian Development Bank 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 institute [84]. NRB uses composition of assets, nonperforming loan to total loan ratio, net nonperforming loan to total loan ratio as the indicators of the quality of assets of commercial banks [52]. The non-performing loans of financial institutions are considered as a major issue in the context of Nepal for last few decades.

2.1.1.3   Proxy of management quality

Management efficiency is one of the crucial component of the CAMEL model that ensures the survival and growth of a bank [85]. It is represented by different financial ratios like Expenses ratio, earning per employee, cost per loan, average loan size and cost per unit of money lent. Asian Development Bank recommends cost per unit of money lent as a proxy of management quality. However, this can not be used as an indicator of management quality in Nepal. Since the data on amount of the total loan mobilized during a particular fiscal year is not available in published financial statements and annual reports. As stated earlier, NRB has skipped up this component of CAMELS in the performance evaluation of commercial banks [37].

2.1.1.4   Composition of earning performance

Earning quality is a very essential criterion, which represents the quality of income in terms of income produced by core activity-income from lending process. Earning ability is one of the factors that affect the strength of an individual bank. Profitability ratios measure the capacity of a bank to generate profits from revenue and assets. A consistent profit not only builds the public confidence in the bank but also absorbs loan losses and provides sufficient provisions. Constantly unprofitable bank risks insolvency on one hand and on the others, unusually high profitability can reflect excessive risk taking of a bank. There are different indicators of profitability. Return on assets, return on equity, interest-spread ratio, earning-spread ratio, gross margin operating profit margin and net profit margin are commonly used profitability indicators. Nepal Rastra Bank uses return on total assets as an indicator of profitability of a commercial bank. In addition, it uses the absolute measures such as interest income, net interest income, non-interest income, net non-interest income, non-operating income, net non-operating income and net profit, to evaluate the profitability of a commercial bank [37].

2.1.1.5   Liquidity ratio for managing liquidity risk

Liquidity indicates the ability of the bank to meet its financial obligation in a timely and effective manner [86]. Recent studies indicate that liquidity risk arises from the inability of a bank to accommodate decreases in liabilities or to fund increases in assets. An illiquidity bank means that it cannot obtain sufficient funds, either by increasing liabilities or by converting assets promptly, at a reasonable cost [87]. In the case of commercial banks, first type of liquidity risk arises when depositors of commercial banks seek to withdraw their money and the second type does when commitment holders want to exercise the commitments recorded off the balance sheet. Commercial banks have to borrow the additional funds or sell the assets at fire sale price to pay off the deposit liabilities. They become insolvent if sale price of the assets are not enough to meet the liability withdrawals. The second type of liquidity risk arises when demand for unexpected loans can not be met due to the lack of the funds. Commercial banks can

raise the funds by running down their cash assets, borrowing additional funds in the money markets and selling off other assets at distressed price. Both liability side liquidity risk (first type risk) and asset side liquidity risk (second type risk) affect the health of commercial banks adversely. But maintaining the high liquidity position to minimize such risks also adversely affects the profitability of banking institutes. Return on highly liquid assets is almost zero. Therefore, financial institutes should strike the tradeoff between liquidity position and profitability so that they could maintain their health sound. Commercial bank's liquidity exposure can be measured by analyzing the sources and uses of liquidity. In this approach, total net liquidity is worked out by deducting the total of uses of liquidity from the total of sources of liquidity. Similarly, BIS maturity laddering model can be used to measure the liquidity of a commercial banks. In addition, different liquidity exposure ratios such as borrowed funds to total assets, core deposit to total assets, loans to deposits, and commitments to lend to total assets are used to measure the liquidity position of a commercial bank [83]. Nepal Rastra Bank uses total loan to total deposit ratio, cash and equivalents to total assets ratio, cash and equivalents to total deposit ratio, NRB balance to total deposit ratio to measure the liquidity position of commercial banks in the course of the performance evaluation of commercial banks [37].

2.1.2 Relationship of bank specific factors and profitability

The review of literature has revealed that bank profitability can be influenced by bank-specific factors and external factors. Bank-specific factors are those factors within the direct control of managers and can be best explained by the CAMEL framework, while external factors include industry-specific and macroeconomic factors. This study focuses only on Bank-specific factors. The review of literatures also revealed that the multiple linear regressions viewed of literatures, are depicted in the conceptual framework (Fig. 2-1).
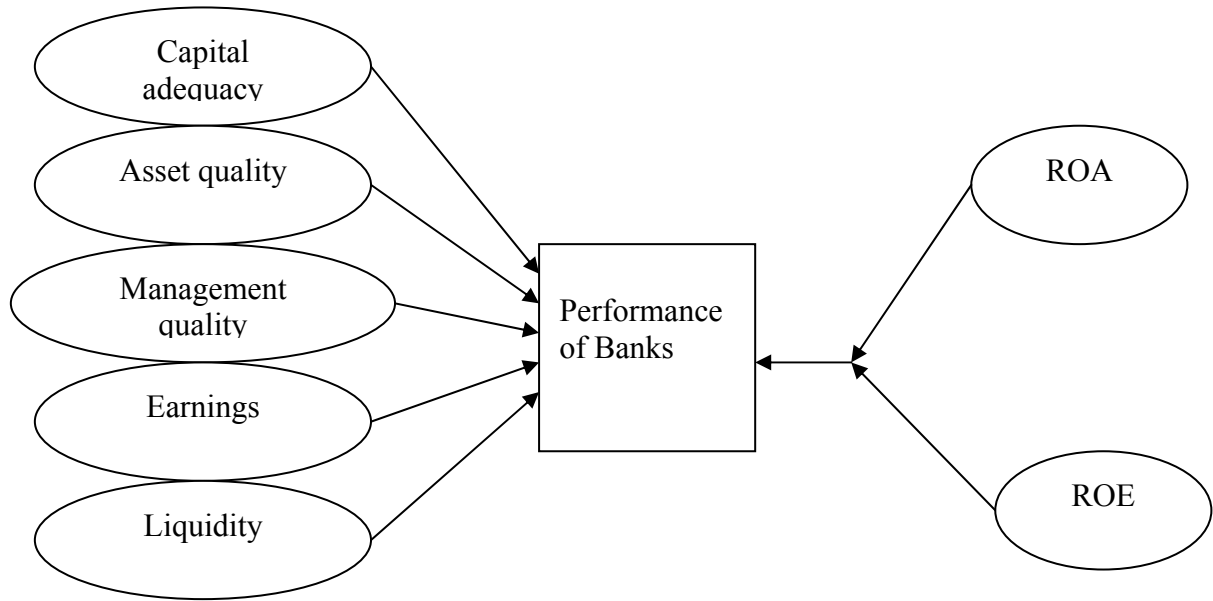
Fig 2-1 Showing relationships among variables

Based on this model, the present study seeks to test the following hypothesis:

H1: There is a significant relationship between capital adequacy ratios and performance of the banks.

H2: There is a significant relationship between asset quality ratios and performance of the banks.

H3: There is a significant relationship between management quality ratios and performance of the banks.

H4: There is a significant relationship between earning ratios and performance of the banks.

H5: There is a significant relationship between liquidity ratios and performance of the banks.

2.1.2.1   Capital adequacy and its effect on profitability

Capital adequacy is one of the significant internal factors of the bank, which influences the level of bank profitability. It has also a direct influence on the profitability of banks by determining its expansion to risky but profitable areas [88]. It refers to the sufficiency

of the amount of equity to absorb any shocks that the bank may experience [89]. The capital structure of banks is highly regulated. This is because capital plays a crucial role in reducing the number of bank failures and losses to depositors when a bank fails as highly leveraged firms are likely to take excessive risk in order to maximize shareholder value at the expense of finance providers [90]. Although there is general agreement that statutory capital requirements are necessary to reduce moral hazard, the debate is on how much capital is enough. Regulators would like to have higher minimum requirements to reduce cases of bank failures, whilst bankers in contrast argue that it is expensive and difficult to obtain additional equity and higher requirements restrict their competitiveness [91].

However, it was argued that, although capital is expensive in terms of expected return, highly capitalized banks face lower cost of bankruptcy, lower need for external funding especially in emerging economies where external borrowing is difficult. Thus well capitalized banks should be profitable than lowly capitalized banks [92]. It was investigated that the impact of bank's characteristics, financial structure and macroeconomic indicators on bank's net interest margins and profitability in the Tunisian banking industry for the 1980-2000 period [93]. It was reported that a strong positive impact of capitalization to ROA. It was also reported the same results after examining the impact of capital to the performance of banks in Philippines from 1990 to 2005 [94]. Capital adequacy is divided into Tier I and Tier II. Tier I capital is primary capital and Tier II capital is supplementary capital, but this study will focus on total equity of the banks as opposed to the minimum requirements.

2.1.2.2   Asset quality and its effect on profitability

The bank's asset quality is another bank specific variable that affects the profitability of a bank. Credit risk is one of the most essential factors that affect the health of the banking institution. The extent of the credit risk depends on the quality of assets held by an individual bank. The quality of assets held by a bank depends on exposure to specific risks, trends in non-performing loans, and the health and profitability of bank borrowers [38]. Among the various risk in bank, credit risk is the

primary cause of bank failure [95]. It was stated that the profitability of a bank depends on its capacity to predict, avoid and examine risks, possibly to face losses brought about by risks occurred [96]. Hence, in making decisions on the allocation of resources to asset deals, a bank must take into account the level of risk to the assets. According to many of the financial institutions, that collapse in 1986 failed due to non-performing loans and that most of the larger bank-failures, involved extensive insider lending, often to politicians [97]. It was observed that banks with high loan growth often assume more risk as credit analysis and review procedures are less rigorous, however returns are high in such loans indicating a risk and return trade-off [98]. It was opined that asset quality significant effect on profitability for Kenya commercial banks for 2001 to 2010 [99]. This was in line with the theory that increased exposure to credit risk is normally associated with decreased firm profitability. Indicating that banks would improve profitability by improving screening and monitoring of credit risk.

2.1.2.3   Liquidity risk and its effect on profitability

Liquidity is another important factor that refers to the ability of the bank to fulfill its obligations, mainly of depositors. Liquidity performance measures the ability to meet financial obligations as they become due and is crucial to the sustained viability of banking institutions. Liquidity risk can adversely affect bank's profits and the capital. Therefore, it becomes the top priority of a bank's management to ensure the availability of enough funds to meet future demands of contributors and borrowers, at reasonable costs. It was presented that adequate level of liquidity is positively related with bank profitability [100]. A high liquidity ratio indicates a less risky and less profitable bank [101]. Thus, management is faced with the problem of liquidity and profitability. Although more liquid assets increase the ability to raise cash on short-notice, they also reduce management's ability to commit credibly to an investment strategy that protects investors [102]. Liquidity has a greater impact on the tradable securities and portfolios. It was suggested that liquidity risk refers to the loss emerging from liquidating a given position [103]. The issue of banks liquidity determinants and their impact on financial performance is crucial to the financial sector of Nepal.

2.1.2.4   Earning performance and its effect on profitability

Profit is a conventional factor of measuring financial performance. Higher earnings normally reflects a lack of financial difficulties and so would be expected to reduce the failure of a bank. The theory of incomes diversifications follows the concept of portfolio theory, which presents that individuals can reduce firm-specific risk by diversifying their portfolios. However, there is a long history of debates about the benefits and costs of diversification in banking literature. The proponents of activity diversification or product mix argue that diversification presents a stable and less volatile income, economies of scope and scale, and the ability to leverage managerial efficiency across products [104]. It was stated that because of activity diversification, the economies of scale and scope caused through the joint production of financial activities directs to increase in the efficiency of banking organizations [105]. In addition, they observed that product mix reduces total risks because income from non-interest activities is not correlated or at least perfectly correlated with income from fee-based activities and as such, diversification should stabilize operating income and give rise to a more stable stream of profits [40]. The contradictory argument to activity diversification is that it leads to increased agency costs, increased organizational complexity, and the potential for riskier behavior by bank managers. It was presented that activity diversification results in more complex organizations, which makes it more complicated for top management to monitor the behavior of the other branches [104]. In addition, they further argued that the benefits of economies of scope exist only to a point. The costs associated with a firms increased complexity may overshadow the benefits of diversification. As such, the benefits of diversification and performance would resemble an inverted-U, in which there would be an optimal level of diversification beyond, which benefits would begin to decline and may ultimately become negative. It was found a positive relationship between total non-interest income divided by total assets, a proxy for income diversification and bank profitability for Philippines commercial banks [95]. It was used a HH index of interest income, commissions, fee income, trading income, non-interest income and other operating income found empirical support of the idea that banks involved in diversification activities expect some benefits [40]. Whereas, it was

observed that activity diversification tends to decrease performance compared to banks more focused in their activities [104].

2.1.2.5   Management quality and its effect on profitability

Management quality is one of the key internal factors that determine the bank profitability. The quality of the management will determine the success of a banking institution. A sound management is crucial for the success of any banking institution; management quality is generally accorded greater weighting in the assessment of the overall CAMEL composite rating. The performance of a bank is largely dependent on the vision, competence, and integrity and risk appetite of the management. Molyneux and Thornton [43] stated that higher the management quality level of a bank, higher its profits level. Hence, a positive relationship is expected between efficiency and profitability of banks. The analysis of the quality of a management is based on the experience of the management and their track records in terms of their vision and competence in running the bank. The analysis of the management also factors in their integrity and the overall corporate governance standards in the bank. The risk appetite in terms of the of the bank's exposure to various categories of asset, adoption of technology and 20 responsiveness to competition and growth strategy impacts the bank's profitability thus is considered during the analysis of bank profitability. Although, the relationship between expenditure and profits appears straightforward implying that higher expenses mean lower profits and the opposite, this may not always be the case. The cause is that higher quantities of expenses may be associated with higher degree of banking activities and therefore higher profits [106].

2.2 Theoretical framework of DEA analysis

Measuring bank efficiency is difficult because there is no satisfactory definition of the bank output. The number of neither accounts nor total assets, total loans, nor total deposits provides a good index of output. Managers need to be concern with how

performance will be measured. Robbins and Coulter define performance as the accumulated results of all the organization's work processes and activities. Performance means efficiency and effectiveness. Efficiency concerns with the relationship between inputs and outputs. Whereas effectiveness is the degree to which the goals of an organization have met. Mathematically, efficiency = output / input. It can be measured with respect to maximization of output, minimization of cost or maximization of profits.

The most common approaches to measure efficiency are parametric approach using econometric techniques, such as the Stochastic Frontier Approach, the Thick Frontier Approach and the Distribution Free Approach. While the nonparametric approach utilizing linear programming method, such as the Free Disposal Hull and the Data Envelopment Analysis. Parametric and nonparametric approaches mainly differ in how they handle the noise and their assumptions regarding the shape of the efficient frontier. However, each has its own strengths and weaknesses. The parametric approach has the advantage of allowing noise in the measurement of inefficiency. However, the approach needs to specify the functional form for the production, cost or profit function. Non-parametric is simple and easy to calculate, as it does not require specification of functional form. It does not need a certain parameter of inputs and outputs, so it can handle multiple inputs and multiple inputs at a time. However, it suffers from the drawback that all deviations from the best-practice frontier are attributed to inefficiency because it does not allow random error to be taken into account. Bank efficiency is difficult because there is no satisfactory definition of the bank output.

Financial ratio analysis is the most known and common approach for measuring performance. Traditionally, analysts have analyzed the efficiency of organizations by focusing on certain simple ratios .In the first quarter of the 20th century; the DuPont firm introduced the return on investment measure and the pyramid of financial ratios. Other models and methods have developed ever since, such as discounted cash flow, residual income, economic value added and cash flow return on investment. Much of the work in the for-profit sector is concerned with financial measures of performance such as profitability, earnings per share and market share. Yeh [55] argues that the major demerit of ratio analysis is that its reliance on arbitrary and misleading benchmark ratios. Further, Sherman and Gold note that financial ratios do not capture the long-term

performance and aggregate many aspects of performance such as operations, marketing and financing. In recent years, there is a trend towards measuring bank performance using one of the frontier analysis methods. In frontier analysis, the institutions that perform better relative to a particular standard are separated from those that perform poorly. Such separation is done either by applying a non-parametric or parametric frontier analysis to firms within the financial services industry. There are two types of efficiency used in the nonparametric measurement: Technical efficiency, produce more outputs from a given set of inputs or use less input to produce a given level of output. Allocative efficiency, which is divided into three types: (A) Cost efficiency, produces a given output at a minimum cost, and (B) Revenue efficiency, maximizes revenue from the utilization of given inputs, and (C) Profit efficiency, maximizes profit from the allocated inputs and outputs. Sherman and Gold were the first to apply DEA to banking. In the banking industry, there are two approaches for selecting the input and output variables. These are: the production approach and the intermediation approach. Under the production approach, banks are analyzed as institutions making use of various labor and capital resources to provide different products and services to customers. Thus, the resources being devoted such as labor and operating cost are considered as inputs while the products and the services such as loans and deposits are deemed as outputs of the banks. This model measures the cost efficiency of the banks. Under the financial intermediation approach, banks are seen as financial intermediaries who collect deposits and other loan able funds from depositors and lend them as loans or other assets to others for profit. The different forms of funds that can be borrowed and the cost associated with performing the process of intermediation are considered as inputs. The forms in which the funds can be lent are outputs. This model measures the economic viability of the banks. In practice, the intermediation approach is the most widely used in the banking literature. In choosing the appropriate approach, Berger and Humphrey suggest that the intermediation approach is the most appropriate for evaluating the entire bank because it is inclusive of interest expense (income paid to depositors), which often accounts for one-half to two-third of total costs. While the production approach is more appropriate for evaluating the efficiency of the bank's branches because branches process customer documents for the banks as a whole. DEA is a linear programming

technique initially developed by Charnes *et al* [95] to evaluate the efficiency of public sector non-profit organizations. DEA calculates the relative efficiency scores of various DMUs in the particular sample. The DMUs could be banks or branches of a bank. DEA compares the efficiency of each of the DMU in that sample with the best practice in the sample. As an efficient frontier technique, DEA identifies the inefficiency in a particular DMU by comparing it to similar DMUs regarded as efficient. The ability of the DEA to identify possible peers or role models as well as simple efficiency scores gives it an edge over other methods. DEA modeling allows the analyst to select inputs and outputs in accordance with a managerial focus. This is an advantage of DEA since it opens the door to what-if analysis. In addition, it works relatively well with small samples. Other advantages of DEA are that it does not require any assumptions to be made about the distribution of inefficiency and it does not require a particular functional form on the data in determining the most efficient DMU. However, DEA is also subject to few limitations. Two of the best known shortcomings are that DEA assumes data to be free of measurement error, and that it is sensitive to outliers. DEA analysis also points out that: (i) having few observations and many inputs and/or outputs will result in many firms appearing on the DEA frontier, (ii) treating inputs/outputs as homogenous commodities when they are heterogeneous may bias the results, (iii) not accounting for differences in the environment may give misleading results, (iv) standard DEA do not control for multi-period optimization or risk managerial decision making.

2.2.1 The concept of different types of efficiencies

The primary purpose of this section is to introduce a number of commonly used efficiency concepts which may be employed in this study and to discuss how these measures may be calculated relative to a given frontier. The concept of economic efficiency flows directly from the microeconomic theory of the firm. Based on the ideas of Debreu [106] and Farrell [107] who built the standard framework of productive efficiency (production frontier), overall economic efficiency can be decomposed into scale efficiency, scope efficiency, pure technical efficiency and allocative efficiency.

Theoretically, a firm is fully efficient if it produces the output level and mix that maximizes profits and minimizes possible costs.
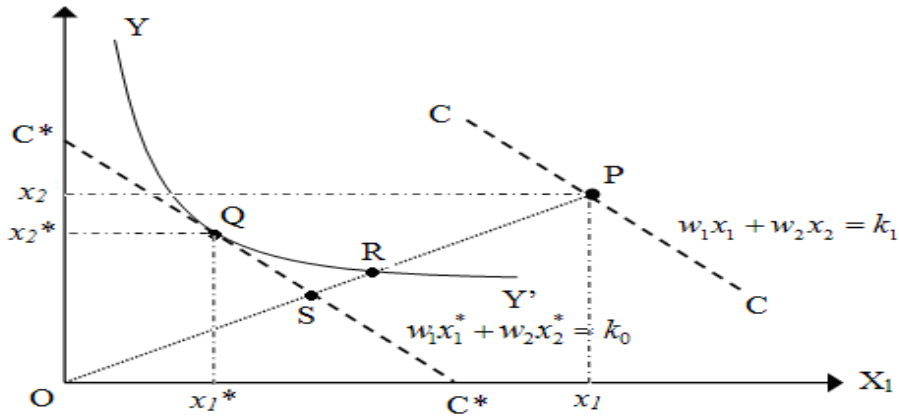
Fig. 2-2 Technical, allocative and cost efficiency

Farell [107] initially assumes that constant returns to scale (CRS) describe the efficient production function or the frontier. The technological set is fully described by the unit isoquant YY' that captures the combination of the inputs (X1, X2) by which the firm can produce a certain output when it is perfectly efficient. In the other words, YY' shows minimum combinations of inputs needed to produce a unit of output. Thus, under this framework, every package of inputs along the unit isoquant is considered as technically efficient while any point above and to the right of it, such as point P, is defined as a technically inefficient producer since the input package that is being used is more than enough to produce a unit of output. Hence, the distance RP along the ray OP measures the technical inefficiency of a producer located at point P. This distance (RP) represents the amount by which all inputs can be reduced without decreasing the amount of output. Geometrically, the technical inefficiency level associated with package P can be expressed by the ratio RP/OP and, therefore, the technical efficiency (TE) of the producer under analysis would be given by the ratio OR/OP, which takes a value between zero and one. A value of one implies that the firm is fully technically efficient.
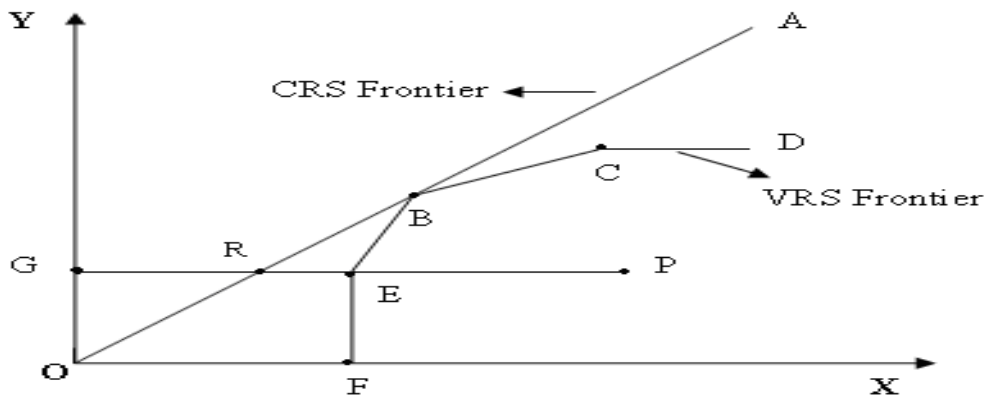
Fig. 2-3 Pure technical and scale efficiency

The concept of scale efficiency ascertains whether the firm operates at an optimum size. In order to measure scale efficiency, the assumption of variable returns to scale replaces that of constant returns to scale. In the above figure, FEBCDR represents a variable returns to scale frontier. For the bank at point P, pure technical efficiency (PTE) equals the ratio of GE / GP. Scale efficiency is the ratio of GR / GE or equal to TE divided by PTE. The value of SE is unity when operating under constant returns to scale. Values of less than unity reflect scale inefficiency. Scale inefficiency could be caused by the firm having to operate under increasing returns to scale or decreasing returns to scale. In order to investigate this, the non-increasing returns to scale frontier is developed, represented by OBCDR. If SE is not equal to unity and PTE is equal to GR/GP, decreasing returns to scale exists. If PTE is not equal to GR/GP, which is based on the frontier OBCDR, then the scale inefficiency is due to increasing returns to scale.

2.2.2 The impact of ownership structure on efficiency

Based on different theories or hypotheses, such as the theories of the firm, principal-agent theory, and market discipline hypothesis etc., many studies have investigated whether different ownership forms may lead to different efficiency levels.

These studies provide useful information on comparative managerial performance and offer potential insights into the direction of future government policies.

2.2.2.1   The public sector versus private ownership

The public sector banks and private sector banks might have different objectives that are not closely aligned [108]. Normally, the main goal of the government is to try to maximize social benefit. Hence, Public Sector banks might be seen as vehicles for raising capital to finance projects with high social returns, but possibly low profit returns or to provide finance to favored groups, which may carry out quite poorly in purely economic terms [109]. Public Sector banks find difficult to resist harmful government interference, whereas private banks (Joint Venture Banks and Domestic Private Banks)are more able to oppose it, and employ more sensible prudential lending policies and/or cost minimization strategies as a consequence [110-111]. Furthermore, Public Sector may face less competition than private banks. Public Sector may not have to worry as much about running into financial difficulties, because losses and excess costs are invariably covered by government subsidies. This in turn implies that Public Sector banks have less incentive to maximize profits or to minimize costs when compared to private banks - which have to make a normal profit over the longer term in order to survive. Finally, Public Sector banks seem to bear more serious agency problems when compared to private banks. It was argued that because all citizens can be considered as the owners of state-owned enterprises, state-owned enterprises ownership will be more dispersed than with private firms [112]. Because of this non-transferable and widely distributed ownership of state-owned banks, private citizens have less motivation to monitor the performance of the management of state-owned enterprises in comparison to the owners of private banks. Hence, managers of state-owned enterprises are likely to enjoy more freedom to pursue a personal agenda because of this. In addition, private banks also face threats of hostile takeover or the possibility of bankruptcy when compared to stated-owned banks [113-115]. These threats provide a natural incentive for the managers of private banks to install more efficient operating procedures than will be the case with the managers of their state owned counterparts.

According to the above theoretical arguments, Public Sector banks may operate less efficiently than comparable private banks. This lower efficiency may be due to greater political intervention, less competition, and weaker corporate governance. However, it does not necessarily mean that private banks always outperform Public sector banks. Many factors could prevent private banks from performing efficiently, such as an under-developed capital market and inadequately developed procedures for takeovers and bankruptcy administration [109]. Moreover, Public Sector banks are generally required to finance politically motivated projects. This means that they will receive larger subsidies and more favorable government treatment than private banks. This could reduce a bank's costs and lead to greater efficiency; at least in the short run [116].Empirical evidence is ambiguous on the relative efficiency of private banks and state-owned banks. Fries and Taci [61] examine cost efficiencies in 15 east European transition countries and they observe higher cost efficiency in private banks when compared to public sector banks. Public sector banks in six transition countries, with respect to both cost and profit efficiency, are less efficient than private banks [117]. Likewise, state-owned banks in China are found to be less efficient than privately owned banks [118-119]. However, there are some studies which generate different results. Altunbas et al. [120] find little evidence in support of the hypothesis that private banks are more efficient than publicly owned banks in terms of both cost and profit efficiency in the German banking sector. It was investigated that the relationship between efficiency and ownership for Turkish commercial banks [57]. They report similar results to those reported earlier in that public sector banks outperform private banks after controlling for several important determining factors (e.g. market structure, bank size and corporate governance, etc.).

2.2.2.2   Joint venture versus domestic ownership

There is some previous studies investigating the relationship between joint venture banks and domestic and bank efficiency. Most work has been carried out for the evaluation of U.S. banking sector and find that joint venture banks have a significantly lower cost or profit efficiency on average than domestic banks [121-124]. Berger et al [125]

present a broad survey on the relative efficiency of foreign versus domestic banks. In this investigation, [125] propose two alternative hypotheses to explain the impact of Joint Venture and domestic ownership on bank efficiency; namely, the worldwide advantage hypothesis and the home field advantage hypothesis. Under the global advantage hypothesis, Joint venture banks will be more efficient than domestic banks. This starts from the inspection that foreign banks may have relatively advantages compared with domestic banks. These comparative advantages stem from better managerial capability and experience, lower costs of capital, and the use of hard-information technologies and procedures in banking operations. In addition, higher risk management skills and access to superior quality services could also increase foreign banks' revenues and reduce their costs in comparison with domestic banks. According to sturm and williams [126], there are two forms of the global advantage hypothesis; namely, the general and the limited forms. The general form asserts that foreign banks, regardless of the location of their headquarters, are able to out-perform domestic banks. The limited form argues that only some foreign banks with headquarters in a particular set of nations are able to operate more efficiently than domestic banks. In contrast to the global advantage hypothesis, the home field advantage hypothesis suggests that domestic banks are generally more efficient than foreign-owned banks. There may be some adverse factors, which weaken the foreign banks' comparative advantages and increase their operating costs. For example, a foreign bank's headquarters, which by definition will be located in its "home" country, may find it difficult to monitor and evaluate the behavior and effort of disparate managers because of the distances involved. Moreover, the diseconomies of operation in the retail sector may lead to foreign banks finding it difficult to attract and maintain customers. Furthermore, foreign banks may face difficulties due to lack of knowledge about local markets or barriers of language, culture and regulations. Therefore, foreign banks may fail to overcome these cross-border disadvantages and operate less efficiently than their domestic counterparts.

By contrast, efficiency studies on developing countries generally support the hypothesis that joint venture banks better than domestic-owned banks. Joint venture banks are more efficient than public sector banks and domestic private banks found for banking sector in pakistan[127]. Foreign banks and banks with a significant foreign

ownership interest are generally more efficient than domestic Hungarian banks [128]. They also demonstrate that the entry of foreign banks creates an environment in which the entire banking system is forced to become more efficient, both directly and indirectly. Likewise, [57,129] on the Turkish banking industry, [126] on the Australian banking sector generally found that foreign banks have substantially better efficiency scores than those of domestic banks. When Classens *et al* [130] comparing the differences in efficiency between joint venture and domestic banks in eighty countries. They found that foreign banks have higher profits than domestic banks in developing countries, but that the opposite is the case for developed countries. Cross-country evidence from transitional economies also suggests that foreign owned banks are more efficient than domestic-owned banks [131, 61].

2.3 Theory of financial development and economic growth

2.3.1 The role of commercial banks in economic growth

The Commercial banks play a key role in development of a national economy because it functions as a medium of collecting and mobilizing resources to finance a business and development project that are essential for economic development.

One of the most significant roles of commercial banks in economic development is as arbiters of risk. This occurs primarily when banks make loans to businesses or individuals. For instance, when individuals apply to borrow money from a bank, the bank examines the borrower's finances, including income, credit score and debt level, among other factors. The outcome of this analysis helps the bank test the likelihood of borrower default. By weeding out risky borrowers, commercial banks lessen the risk of financial losses. As a result, loans that mature without any problems generate a larger pool of funds for the bank to lend, further supporting economic development.

Financial intermediaries' help to reduce the transaction cost of obtaining information about company, manager, market situation that are essential to make investment decision. They also help to identify the best investment opportunities. Besides this, they also monitor the fund they lent to the business organization or other

types of borrowers, which ensure the effective utilization of fund which in turn makes savers more willing to invest. As a result the business sector of a country tends to move in positive direction making progress possible. Thus the effectiveness of a financial corporation directly influences firm's performance which in turn impacts on aggregate growth rate. In case of India, there exists bi-directional casualty between financial deepening economic growths. Thus, policies, which effect financial deepening, are likely to have an effect on economic growth and vice versa. The financial sector policies may affect financial deepening by altering bank behavior and in particular by changing bank's willingness to attract deposits [132].

2.3.2 Financial indicators and growth

The business of banks, or banking, is a fuzzy subset of financial services. Banks borrow money by accepting funds deposited on current accounts, by accepting term deposits, and by issuing debt securities such as banknotes and bonds. One the other hand, Banks lend money by making advances to customers on current accounts, by making installment loans, and by investing in marketable debt securities and other forms of money lending. In an economy, the banking industry helps match the savings of the households with the investment requirement of firms because of the informational advantage. It is well known that commercial banks acquire private information in monitoring loans. For example, commercial banks inspect factory premises and inventory, or they might be privy to investment opportunities available to the firms. In contrast, households do not have access to such information. In addition, they expend costly resources for any information on the firm. Banks exert a fundamental influence on capital allocation, risk sharing, and economic growth. Gerschenkron [133] holds this influence to have been of capital importance. Gerschenkron's position regarding the role of banks in economic growth and development has led to a continuing debate. The importance of the impact of banking sector on economic performance is still far from established. From a theoretical standpoint, the idea of "scarcity of funds" could be useful in the study of economic growth: underdeveloped economies with a low level of financial intermediation and a small, illiquid banking industry may be unable to channel savings efficiently. Banks can help by risk pooling. That is, by collecting savings from

many people and investing them in a large diversified range of projects, a bank allows even small savers to take advantage of the law of large numbers and get a reasonably safe rate of return. Well functioning banks can channel savings toward the most efficient uses. Banks can also help to alleviate agency problems by monitoring investors and making sure that they are making productive use of their loans [134].

2.3.3 Efficiency and economic growth

There are several hypotheses that link the efficiency of banking institutions and economic growth. First, if banking institutions are efficient, they will retain a smaller proportion of saving, and therefore a greater amount of resources will be devoted to productive investments. Second, the link between bank efficiency and growth can also be understood in terms of the agency relationship between lender and borrower. External finance is more expensive than internal finance due to the existence of an external financial premium. The more efficient the bank is, the lower the premium resulting in cheaper credit available for investment, which promotes economic growth. On the other hand, lower bank efficiency and larger margins harm economic growth since the financial institution retains a greater proportion of saving.

In the model developed by King and Levine [135], financial intermediaries promote growth by affecting the entrepreneurial activities that lead to productivity improvements in three ways. First, financial intermediaries evaluate prospective entrepreneurs and choose the most promising projects. Second, financial intermediation allows investors to diversify the risk associated with uncertain innovative activities. Third, financial intermediaries reveal the potential rewards to engaging in innovation, relative to continuing to make existing products with existing techniques. Thus, more-efficient financial intermediaries foster productivity improvement by choosing higher quality entrepreneurs and projects, and by more effectively mobilizing external financial for these entrepreneurs.

2.4 Chapter summary

This chapter presents a theoretical framework relating to CAMEL Model for evaluating the banking performance and DEA Model for evaluating the technical efficiency. Further, more, theoretical Prescription about economic growth is discussed for relating the financial indicators with economic growth. Risk Management is an inevitable component of successful banking. Banks also need to encourage healthy competition and avoid risky behavior and practices for long-term sustainability. Though some alternative bank performance evaluation models have been proposed, the CAMEL framework is the most widely used model, and Basle Committee recommends it on Bank Supervision and International Monetary fund. Efficiency measures deviations in performance from the predicted performance of the "best practice" firms on the efficient frontier, facing a number of exogenous market factors. Technical efficiency can be decomposed into pure technical efficiency and scale efficiency. When a firm maximizes the output from a given level of input, pure technical efficiency occurs. A firm has scale efficiency when it operates in the range of constant returns to scale. Therefore, this research intends to focus on analyzing technical efficiency under intermediation and profit oriented approach in the Nepalese commercial banking sector.

Chapter 3 Models Description, Selection of Variables, Data Collection and Methodology

In recent years, the Nepalese banking sector has experienced significant institutional, structural and legal changes because of the deregulation and liberalization programme implemented by the Nepalese government. The main objective of this chapter is to describe the modeling framework used to analysis the ratio and to measure the technical efficiency of Nepalese banks and linkage between financial indicators and economic growth.

3.1 The financial performance of commercial banks using CAMEL model

The Financial analysis is the process of identifying the financial strength and weakness of the firm there are more then 200 ratios existing today, but in this study some selected ratios are used which are based on the CAMEL Framework to demonstrate the risk management of the commercial banks such as capital adequacy, asset quality, management, earnings and liquidity. All the ratios be used to test the hypothesis. This study uses a descriptive financial analysis to describe, measure, compare, and classify the financial situations of Nepalese commercial banks and as well as applied an econometric multivariate regression model to test the significance of variables on performance of Nepalese commercial banks. The following ratios are used to analyze the CAMEL framework.

3.1.1 Empirical specification for ratio analysis

In order to see how public sector banks, joint venture banks and domestic private banks has performed over 6 years, the study uses 7 financial ratios and two show the relationship between bank specific variables and profitability, two dependent variables and five independent variables were used. The two performance indicators – Return on assets and Return on equity serve as dependent variables. The other internal bank characteristics –Capital adequacy ratio, Net Interest margin, Non-Performing Loan, Credit to Deposit ratio, Interest expenses to total loan - serve as explanatory variables. So first calculated ratio of each bank and then calculated average of those ratios.

3.1.2 Dependent and independent variables

3.1.2.1 Profitability ratios

Generally, accounting profits are the difference between revenues and costs. Profitability is considered the most difficult attributes of a firm to conceptualize and to measure [136]. These ratios are used to assess the ability of the business to generate earnings in comparison with its all expenses and other relevant costs during a specific time. More specifically, these ratios indicate firm's profitability after taking account of all expenses and income taxes, the efficiency of operations, firm pricing policies, profitability on assets and to shareholders of the firm .Profitability ratios are generally considered to be the basic bank financial ratio in order to evaluate how well bank is performing in terms of profit. For the most part, if a profitability ratio is relatively higher as compared to the competitor(s), industry averages, guidelines, or previous years' same ratios, then it is taken as indicator of better performance of the bank. Study applies these criteria to judge the profitability of the Nepalese commercial banks Return on assets, Return on Equity.

Return on assets

Return on Asset is a useful indicator of bank profitability. ROA is calculated by dividing net income and total assets giving a ratio of earnings generated from invested capital. ROA is management effective in generating profit on each dollar of investment [137]. Heavy emphasis is put on ROA in the banking business as it precisely measures asset performance. ROA as a performance indicator and as dependent variables [138]. ROA is the dependent variable in our study because it will help identify the effectiveness of bank assets.

$$\text{ROA} = \frac{\text{Net income}}{\text{Total assets}} \qquad (3-1)$$

Return on equity

Return on equity indicates the profitability to shareholders of the firm after all expenses and taxes. It measures how much the firm is earning after tax for each dollar invested in the firm. In other words, ROE is net earnings per dollar equity capital [139]. It is also an indicator of measuring managerial efficiency [140-142]. Mostly, higher ROE means better managerial performance; however, a higher return on equity may be due to debt (financial leverage) or higher return on assets. Financial leverage creates an important difference between ROA and ROE in that financial leverage always magnifies ROE. This will always be the case as long as the ROA is greater the interest rate on debt [136]. Usually, there is higher ROE for high growth companies. In addition, ROE is the dependent variable in our study of profitability because it will show how efficient the bank management uses shareholders' money.

$$\text{ROE} = \frac{\text{Net income}}{\text{Total equity capital}} \qquad (3-2)$$

3.1.2.2　　Capital adequacy ratio

Capital adequacy ratio is the primary tool to analyze the capital fund of a bank. The capital adequacy ratio is based on total risk- weighted assets (TRWA) of the bank. Capital adequacy ratios are a measure of the amount of a bank's capital expressed as a percentage of its risk weighted credit exposures. This ratio is used to examine adequacy of total capital fund and core capital, which estimated by the following formulas:

$$\text{CAR} = \frac{\text{Total capital fund}}{\text{TRWA}} \qquad\qquad (3-3)$$

3.1.2.3　　Net interest margin

Net interest margin is the difference between the interest income from the borrower and interest expense to the depositors expressed as a percentage of average earned assets. NIM is a simple formula that measures how profitable a bank is in terms of loans. [93] included NIM as a performance indicator. Consequently, NIM is included in the study of profitability because it determines the profitability of bank lending. The net interest margin indicates how successful the bank has been in borrowing funds from the cheapest sources and in maintaining an adequate spread between its returns on loans and security investments and the cost of its borrowed funds. If the NIM rises, loan and security income must be rising or the average cost of funds must be falling or both. A declining NIM is undesirable because the bank's interest spread is being squeezed, usually because of rising interest costs on deposits and other borrowings and increased competition today.

In contrast, the non-interest margin reflects the banks spread between its non-interest income (such as service fees on deposits) and its non-interest expenses (especially salaries, wages, and overhead expenses). For most banks, the non-interest margin is negative. Management will usually attempt to expand fee income, while controlling closely the growth of non-interest expenses in order to make a negative non-interest margin less negative.

The earnings spread measures the effectiveness of the bank's intermediation function of borrowing and lending money, which, of course, is the bank's primary way of generating earnings. As competition increases, the spread between the average yields on assets and the average cost of liabilities will be squeezed, forcing the bank's management to search for alternative sources of income, such as fees from various services the bank offers.

$$NIM = \frac{\text{Interest income - Interest expenses}}{\text{Total loan}} \qquad (3-4)$$

3.1.2.4 Non –performing loan ratio

Non-performing loans refer to past due loan accounts whose principal or interest is unpaid for thirty days or more after due date. NPL ratio is calculated by dividing non-performing loans to total loans. As well as the ratio of non-performing loans to total loans or total liabilities is considered to evaluate the asset quality in performance. Thus, Non- performing loan has estimated the following formula:

$$NPL = \frac{\text{Non - performing loan}}{\text{Total loan}} \qquad (3-5)$$

3.1.2.5 Interest expenses/ total loan

Management quality plays a big role in determining the future of the bank. The management has an overview of a bank's operations, manages the quality of loans and has to ensure that the bank is profitable. The management sets the profitability objective and, in conjunction, determines the risk level to be undertaken by the bank. The management quality of a bank can be measured by examining its operating efficiency, which comprises of cost management and the productivity of employees. Thus, according to the study of [143] interest expenses divided to total loans can be measured as the bank management quality. For this variable the following ratio have been chosen for the study:

$$\text{IETTL} = \frac{\text{Interest expenses}}{\text{Total loan}} \qquad (3-6)$$

3.1.2.6   Credit/ deposit ratio

Banks need liquidity to meet deposit withdrawals and satisfy customer loan demand. Faced with liquidity risk, a bank may be forced to borrow emergency funds at an excessive cost to cover its immediate cash needs, hence reducing its earnings. Banks need to have a sound liquidity management to avoid incurring a high liquidity risk. This ensures that immediate funds will be available at the lowest cost. Liquidity ratio mainly can be examined by evaluating the following ratio – Credit to Deposit (CDR). The credit / deposit ratio (CDR) is a major tool to examine the liquidity of a bank. CDR ratio measures the ratio of fund that a bank has utilized in credit out of the deposit total collected. More the CDR ratio more the effectiveness of the bank to utilize the fund it collected. The CDR is derived by the following formula:

$$\text{CDR} = \frac{\text{Credit}}{\text{Deposit}} \qquad (3-7)$$

3.1.3 Model fit for banks specific factors and profitability

To identify the determinants of profitability of the Nepalese commercial banks during 2005-2010 years, this study has chosen multiple regression analysis. The Econometric models used in this study examined the effects of bank specific variables on:

$$\text{ROA} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \qquad (3\text{-}8)$$
$$\text{ROE} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \qquad (3\text{-}9)$$

The profitability ratios (ROA and ROE) are assumed as dependent variables while capital adequacy ratio, non-performing loan ratio, and interest expenses to total loan , net interest margin ratio and credit to deposit ratio are as independents variables.

Where, X1- CAR (Tier 1 Capital + Tier 2 Capital / risk weighted assets), X2- NPL (non-performing loans/total loans), X3- IETTL –Interest expense / total loans, X4- NIM – Net interest margin, X_5- CDR- Credit to deposit ratio. In the previous equation, β_0 is constant and β is coefficient of variables while ε is the residual error of the regression.

3.2 Explanation of technical efficiency of commercial banks

From a methodological perspective, there are several approaches that can be used to examine the efficiency of banks, such as stochastic frontier analysis, thick frontier approach, distribution free approach, and DEA. Berger *et al*[144], Berger, and Humphrey [145] provide key discussions and comparisons of these methods in the context of banking. In the present study, following several recent studies we use DEA to estimate the efficiency of banks. One of the well-known advantages of DEA, which is relevant to our study, is that it works particularly well with small samples. DEA, as parametric techniques specify a large number of parameters, making it necessary to have available a large number of observations [146]. Other advantages of DEA are that it does not require any assumption to be made about the distribution of inefficiency and that it does not require a particular functional form on the data in determining the most efficient decision making units. On the other hand, the shortcomings of DEA are that it assumes data to be free of measurement error and it is sensitive to outliers. We only briefly outline DEA here, while more detailed and technical discussions can be found in [147-149]. The notations adopted below are those used in [147]. DEA uses linear programming for the development of production frontiers and the measure-ment of efficiency relative to the developed frontiers [12]. The best-practice production frontier for a sample of DMUs, in our case banks, is constructed through a piecewise linear combination of actual input–output correspondence set that envelops the input–output correspondence of all DMUs in the sample [149]. Each DMU is assigned an efficiency score that ranges between 0 and 1, with a score equal to 1 indicating an efficient DMU with respect to the rest DMUs in the sample. DEA can be implemented by assuming either constant returns to scale or variable returns to scale. In their seminal study, Charnes *et al* [12] proposed a

model that had an input orientation and assumed CRS. Hence, the output of this model is a score indicating the overall technical efficiency of each DMU under CRS.

3.2.1 Technical, pure technical, and scale efficiencies: DEA models

From a methodological perspective, there are several approaches that can be used to examine the efficiency of banks, such as stochastic frontier analysis, thick frontier approach, distribution free approach, and DEA. As noted above, we intend to apply the technique of DEA for computing the measures of technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency(SE) for individual banks. In general, DEA is referred to as a linear programming technique that converts multiple incommensurable inputs and outputs of each decision making unit (DMU) into a scalar measure of operational efficiency, relative to its competing DMUs. DEA identifies 'peer' DMUs for an individual DMU and then estimates the efficiency of the DMU by comparing its performance with that of the best practice DMUs chosen from its peers. Note that the idea here of best practice is not some theoretical and possibly unattainable concept, but the DMU(s) performing best amongst its (their) peers, which is assigned an efficiency score of 1.
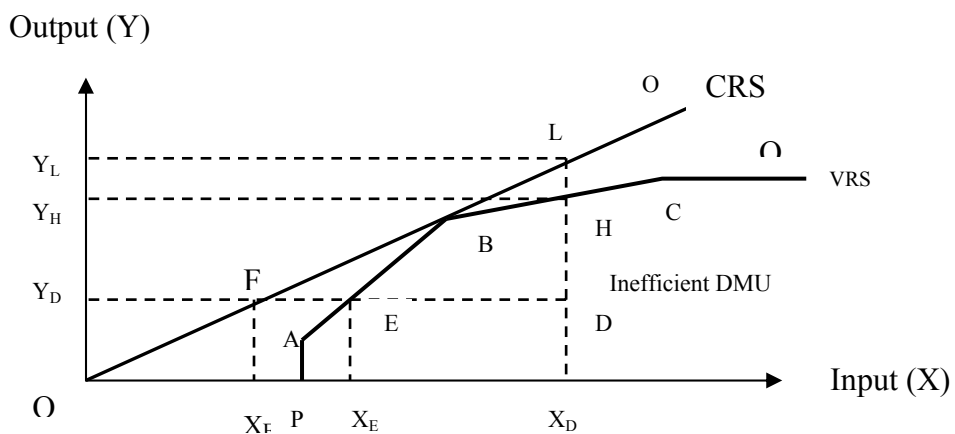
Fig 3-1CRS and VRS assumes

These units constitute the referrals 'standards' and 'envelop' the other units and, thus, form the efficient frontier. DEA involves solving a linear programming problem for each DMU.The solution to the linear programming problem consists of information about the peers of the DMU and the efficiency of the DMU relative to its peer group. In DEA, technical efficiency (TE) can be viewed from two perspectives. First, input oriented TE focuses on the possibility of reducing inputs to produce given output levels. Second, output-oriented TE considers the possible expansion in outputs for a given set of input quantities. A measure of TE for a DMU0an be defined as possible output in output-oriented context, or input minimum possible input Actual input in input-oriented context. O quantify a measure of TE, we need to find out the divergence between actual production and production on the boundary of the feasible production set. This set summarizes all technological possibilities of transforming inputs into outputs that are available to the organization. A DMU is technically inefficient if production occurs within the interior of this production set. measure of scale efficiency (SE) can be obtained by comparing TE measures derived under the assumptions of constant returns-to-scale (CRS) and variable returns-to-scale (VRS). As noted above, the TE measure corresponding to CRS assumption represents technical efficiency which measures inefficiencies due to the input/output configuration and as well as the size of operations. The efficiency measure corresponding to VRS assumption represents pure technical efficiency, which measures inefficiencies due to only managerial underperformance. The relationship SE TE /PTE provide a measure of scale efficiency. For the one output and one-input case, the derivation of the concepts of technical, pure technical, and scale efficiency under DEA approach is illustrated in Fig. 3-1

Fig. 3- 1 provides two efficient frontiers: one assumes CRS (shown by line OO) and one assumes VRS (shown by line segment PABCQ). Projecting the inefficient DMU D onto VRS efficient frontier (point E) by minimizing input X while holding output Y constant (i.e., input-orientation), PTE for DMU D is defined as E D X X . Similarly, if we change the optimization mode to that of output maximization, PTE for firm D is now defined as D H Y Y .Focusing on the CRS efficient frontier, DMU D is projecting onto point F, where the input-oriented OTE measure is defined by F D X X .

Output oriented TE measure is similarly defined as D L Y Y. However, given that the slope of CRS efficient frontier equals to 1, then   F D D L X X Y Y i.e., orientation does not change TE scores. Extending the above illustration to scale efficiency, input- and output-oriented scale efficiency measures are defined as F E X X and H L Y Y , respectively. Increasing returns-to-scale imply that the DMU can gain efficiency by increasing production of Y (which generally occurs when producing on the PAB of VRS efficient frontier), while decreasing returns-to-scale imply that a reduction in scale increases efficiency (which occurs on the portion BCQ of VRS efficient frontier). If one is producing optimally, then, there is no efficiency gain by changing the scale of production. This occurs when firm operate at the point B where the two frontiers are tangent i.e., OTE=PTE. The preceding graphical depiction of technical, pure technical, and scale efficiency measures can now be reframed in terms of linear programming models that can be used to work out efficiency of individual DMUs using actual data on input and output variables. Several different mathematical programming models have been proposed in the literature [12,150]. Essentially, each of these models seeks to establish which of DMUs determine the best practice or efficient frontier. The geometry of this frontier is prescribed by the specific DEA model employed. In the present study, we utilized CCR model, named after Charnes, Cooper, and Rhodes [12] and BCC model, named after Banker, Charnes and Cooper [151] to obtain efficiency measures under CRS and VRS assumptions, respectively. The measure of efficiency provided by CCR model is known as technical efficiency and denoted as CCR .The last restriction imposes variable returns-to-scale assumption on the reference technology. The measure of efficiency provided by BCC model is known as pure technical efficiency and denoted as BCC. The ratio (CCR/   BCC) provides a measure of scale efficiency. Note that all aforementioned efficiency measures are bounded between one and zero. The measure of scale efficiency does not indicate whether the DMU in question is operating in the area of increasing or decreasing returns-to-scale. The nature of returns-to-scale can be determined from the magnitude of optimal then DMU under evaluation is a frontier point, i.e., there is no other DMUs that are operating more efficiently than this DMU. Otherwise, if, then the DMU under evaluation is inefficient, i.e., this DMU can either increase its output levels or decrease its input levels.

3.2.2 Variable selection of intermediation and profit-oriented approach

In the literature on banking efficiency, there are mainly three types of bank performance approach namely "production approach", "intermediation approach" and" profitability approach"[152]: i) the production approach, also called the service provision or value added approach; and ii) the intermediation approach, also called the asset approach. Production approach and intermediation approach apply the traditional microeconomic theory of the firm to banking and differ only in the specification of banking activities. The production approach treats banks as the providers of services to customers. The output under this approach represents the services provided to the customers and is best measured by the number and type of transactions, documents processed or specialized services provided over a given time period. However, in case of non-availability of detailed transaction flow data, they are substituted by the data on the number of deposits and loan accounts, as a surrogate for the level of services provided. In this approach, input includes physical variables (like labor, material, space or information systems) or their associated cost. This approach focuses only on operating cost and completely ignores interest expenses. The intermediation approach treats banks as financial intermediaries channeling funds between depositors and creditors. In this approach, banks produce intermediation services through the collection of deposits and other liabilities and their application in interest-earning assets, such as loans, securities, and other investments. This approach is distinguished from production approach by adding deposits to inputs, with consideration of both operating cost, interest cost .Berger, and Humphrey [153] pointed out that neither of these two approaches is perfect because they cannot fully capture the dual role of banks as providers of transactions/document processing services and being financial intermediaries. Nevertheless, they suggested that the intermediation approach is best suited for analyzing bank level efficiency, whereas the production approach is well suited for measuring branch level efficiency. This is because, at the bank level,

management will aim to reduce total costs and not just non-interest expenses, while at the branch level a large number of customer service processing take place and bank funding and investment decisions are mostly not under the control of branches. Also, in practice, the availability of flow data required by the production approach is usually exceptional rather than in common. Therefore, as in majority of the empirical literature, we adopted the intermediation approach as opposed to the production approach for selecting input and output variables for computing the various efficiency scores for individual commercial banks. The research will apply the input-oriented DEA approach will be treated the commercial banks as financial intermediary institutions, deposits and interest expenses will be applied as input variables while loan advances and interest income will be as the output variables. Actually, the DEA model is a non statistical method and the input-oriented DEA model mainly focuses on the input minimization to get the efficiencies keeping the output variables at their current levels. All the input and output variables will be measured in Nepalese Rupees.

A third kind of approach, the profitability approach, which is a relatively newer approach, is also being started to use. The inputs of production and profitability approach are kind of similar but the outputs of profitability approach are, as the name suggests, more profit oriented; such as interest income and non-interest income. In the present study, we adopted the profit-oriented approach to find out the technical efficiency using interest expenses and loan loss provision as inputs and three outputs - net interest income, commission income and other operating income.

3.2.3 Risk management factors in OTE, PTE and SE

In order to further investigate the effects of risk management factors on the technical, pure technical and scale efficiencies, this study will follow with a Tobit model. Tobit Regression Analysis As a part of two-stage DEA approach, we carried out a regression analysis to estimate the effect of a set of risk management variables on the overall technical efficiency of commercial banks. In DEA literature, the influence of these variables is usually analyzed by applying either tobit or logistic regression models because the distribution of efficiency scores is confined to the interval (0, 1). Following

Fotios Pasiouras [154]. we applied Tobit regression analysis in the present context to explore the factors causing inter-bank differences in overall technical efficiency. Tobit regression is a part of a category of statistical models. Tobit regression is useful when observed outcome is restricted to be binary and takes the values 0 or 1.which produces values between 0 and 1.In the present study, we defined the dependent variable on the basis of relative technical efficiency scores obtained from CCR model, PTE from VRS and SE. The dependent variable takes value equal to 0 for inefficient banks and value equal to 1 when bank is efficient. Thus, the dependent variable turns out to be a binary variable having values either 0 or 1. The independent variables are the Risk management factors (like Return on assets, Return on equity, Capital adequacy ratio, Non-performing loan, Credit to deposit ratio, Size and ownership) that can cause the inter-bank variations in overall technical efficiency.

3.2.4 Variables selection

The DEA approach is sensitive to variables selection, which means there are more chances some inefficient units become efficient as the number of variables increases [155]. Because of the relatively small sample size in our study, the more the variables we choose, there are more chances some inefficient units become efficient. Moreover, the availability of data is very limited in the Nepalese bank financial statement, hence we choose the variables that are available in the financial statements for all the sample period and based on similar studies, which used small sample size [156-158]. The input variables used in this study are interest expense because the interest could reflect the cost level of the Nepalese commercial Banks. The output variables include interest income can respectively reflect the level of main business and intermediary business of the banks, hence, should treat as output variables. Deposit is a controversial variable where some studies treat it as input variable. Chen and Yeh [159] use the intermediation approach and treat deposits as an input; they explain that the main business of bank is to use the funds from deposit to lend to others. However, Yao et al[160] argue that "deposits are an intermediate substance which helps banks achieve interest income and

non-interest income through banking services and the input is not the deposit itself but the resources that are used to generate the deposit. Furthermore, Zhang [161] explains that banks in China do not charge any fees when offering the deposit business and the author asserts that this would have positive external effects for the society. Hence, Zhang [161] treated deposit as an output variable in his study. In our study, we treat deposit as input. Table3-1 presents the input and output variables under intermediation approach and profit oriented approach.

Table3-1 Variables under intermediation approach and profit oriented approach

Intermediation approach		Profit oriented approach	
Input	Output	Input	Output
Deposit	Loan and Advance	Interest expenses	Net interest income
Interest expenses	Interest Income	Loan loss provision	Commission income
			Other operating income

3.2.5 Details of the models

The research applied the DEA technique based on constant return on scale and variable return on scale assumptions. The Technical efficiency and pure technical efficiency under intermediation approach and Profit oriented approach were determined by CRS model and VRS model, respectively. The scale efficiency was found by TE/PTE. Profit efficiency is a wider concept as it covers the effects of choice of vectors invoked by taking into account the costs and revenues involved in the system. It measures how much a bank can maximize its profits given the level of inputs programming.

Consider a set of decision making units to be evaluated, DMUj (j =1, 2, . . . , n) that consumes the amounts $X_j = \{x_{ij}\}$ of m different inputs (i =1,   . . . , m) and produces the amounts $Y_j = \{y_{rj}\}$ of r outputs (r=1, . . . , s). The technical efficiency of a particular DMU_0 under the assumption of constant returns to scale can be obtained from the following linear programs:

$$\max \sum_{r=1}^{s} u_r y_{r0} / \sum_{i=1}^{m} v_i x_{i0}$$

$$s.t. \sum_{r=1}^{s} u_r y_{rj} / \sum_{i=1}^{m} v_i x_{ij} \leq 1 \quad j = 1, \cdots, n \tag{3-10}$$

$$u_r, v_i \geq \varepsilon; r = 1, \cdots, s; i = 1, \cdots, m$$

Its dual program is as follows:

$$\min \theta - \varepsilon(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+)$$

$$s.t. \sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = \theta x_{i0} \quad i = 1, \cdots, m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} - s_r^+ = y_{r0} \quad r = 1, \cdots, s \tag{3-11}$$

$$\lambda_j, s_i^-, s_r^+ \geq 0 \quad j = 1, \cdots, n$$

BCC model can be defined as follows:

The BCC model allows a calculation of pure technical efficiency that is measured without the scale efficiency. The mathematical form of BCC model is as follows:

$$PTE_0 = \max (\sum_{r=1}^{s} u_r y_{r0} + \mu_0) / \sum_{i=1}^{m} v_i x_{i0}$$

$$s.t. \sum_{r=1}^{s} u_r y_{rj} + \mu_0 - \sum_{i=1}^{m} v_i x_{ij} \leq 0 \quad j = 1, \cdots, n$$

$$u_r, v_i \geq \varepsilon; r = 1, \cdots, s; i = 1, \cdots, m$$

Its dual program is as follows:

$$\min \theta_0^{BCC} - \varepsilon(\sum_{r=1}^{s} s_r^+ + \sum_{i=1}^{m} s_i^-)$$

$$s.t. \sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = \theta_0^{BCC} x_{i0} \quad i = 1, \cdots, m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} - s_r^- = y_{r0} \quad r = 1, \cdots, s$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j, s_i^-, s_r^+ \geq 0; i = 1, \cdots, m; r = 1, \cdots, s; j = 1, \cdots, n$$

The research will be applied the two-stage DEA technique based on CCR and BCC models to obtain efficiency measures under CRS and VRS assumptions. The technical efficiency (TE) and pure technical efficiency (PTE) will be determined by CRS model and VRS model, respectively. The scale efficiency will be found by TE/PTE.

The CCR model can be defined as follows:

Consider a set of decision making units to be evaluated, DMUj (j =1, 2, . . . , n) that consumes the amounts Xj ={xij } of m different inputs (i =1, . . . , m) and produces the amounts Yj ={yrj } of r outputs (r=1, . . . , s). The technical efficiency of a particular DMU_0 under the assumption of constant returns to scale can be obtained from the following linear programs:

$$\max \sum_{r=1}^{s} u_r y_{r0} / \sum_{i=1}^{m} v_i x_{i0}$$

$$s.t. \sum_{r=1}^{s} u_r y_{rj} / \sum_{i=1}^{m} v_i x_{ij} \leq 1 \quad j = 1, \cdots, n$$

$$u_r, v_i \geq \varepsilon; r = 1, \cdots, s; i = 1, \cdots, m$$

Its dual program is as follows:

$$\min \theta - \varepsilon(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+)$$

$$s.t. \sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = \theta x_{i0} \quad i = 1, \cdots, m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} - s_r^+ = y_{r0} \quad r = 1, \cdots, s$$

$$\lambda_j, s_i^-, s_r^+ \geq 0 \quad j = 1, \cdots, n$$

BCC model can be defined as follows:

The BCC model allows a calculation of pure technical efficiency that is measured without the scale efficiency. The mathematical form of BCC model is as follows:

$$PTE_0 = \max (\sum_{r=1}^{s} u_r y_{r0} + \mu_0) / \sum_{i=1}^{m} v_i x_{i0}$$

$$s.t. \sum_{r=1}^{s} u_r y_{rj} + \mu_0 - \sum_{i=1}^{m} v_i x_{ij} \leq 0 \quad j = 1, \cdots, n$$

$$u_r, v_i \geq \varepsilon; r = 1, \cdots, s; i = 1, \cdots, m$$

Its dual program is as follows:

$$\min \theta_0^{BCC} - \varepsilon \left(\sum_{r=1}^{s} s_r^+ + \sum_{i=1}^{m} s_i^- \right)$$

$$s.t. \sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = \theta_0^{BCC} x_{i0} \quad i = 1, \cdots, m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} - s_r^- = y_{r0} \quad r = 1, \cdots, s$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j, s_i^-, s_r^+ \geq 0; i = 1, \cdots, m; r = 1, \cdots, s; j = 1, \cdots, n$$

The estimations will be presented under different significant levels (1 %, 5% and 10%). The Tobit model can be defined as follows:

$TE_{it} = C + \beta_1 ROA_{it} + \beta_2 ROE_{it} + \beta_3 CAR_{it} + \beta_4 NPL_{it} + \beta_5 CDR_{it} + \beta_6 SIZE_{it} + \beta_7 OWN_{it} + \mu_{it}$ (3-12)

$PTE_{it} = C + \beta_1 ROA_{it} + \beta_2 ROE_{it} + \beta_3 CAR_{it} + \beta_4 NPL_{it} + \beta_5 CDR_{it} + \beta_6 SIZE_{it} + \beta_7 OWN_{it} + \mu_{it}$ (3-13)

$SE_{it} = C + \beta_1 ROA_{it} + \beta_2 ROE_{it} + \beta_3 CAR_{it} + \beta_4 NPL_{it} + \beta_5 CDR_{it} + \beta_6 SIZE_{it} + \beta_7 OWN_{it} + \mu_{it}$ (3-14)

Where,

TE_{it} = Technical efficiency score obtained by i-th bank in time period t under CRS

PTE_{it} = Pure technical efficiency score obtained by i-th bank in time period t under VRS

SE_{it} = Scale efficiency score obtained by i-th bank in time period t.

ROA_{it} and ROE_{it} - ROA_{it} represents the Return on Assets for bank i in year t while ROE_{it} represents the Return on Equity for bank i in year t. They are used to measure the profitability and indicate the earning performance within CAMEL model.

CAR_{it} - (Tier 1 Capital + Tier 2 Capital / Risk Weighted Assets) - CAR_{it} represents the Capital Adequacy Ratio for bank i in year t. This variable evaluates the capital adequacy within the CAMEL framework and helps for evaluating capital risk.

NPL_{it} - (Non-performing Loans/Total Loans) - NPL_{it} represents the non performing loan ratio for bank i in year t. It is used to measure the asset quality within the CAMEL framework. It helps to indicate credit risk.

CDR_{it} - CDR_{it} represents the Credit to Deposit Ratio for bank i in year t. It helps in evaluating bank liquidity risk in the CAMEL framework.

Own_{it} - Dummy variable – 0 if i-th bank in time period t is owned by Public sector banks otherwise 1.

$SIZE_{it}$ –SIZE which i-th bank has time period t. It measures the size effect of firm. Size is measured in total assets. An asset is the natural logarithm of the value of total assets.

C, β_1, β_2, ...… β_7 are the set of parameters to be estimated. μ denotes the error term.

In this model, the ROA, ROE, CAR, CDR and SIZE are predicated to have a positive impact on the efficiency of the commercial banks while NPL is expected to have negative impact on the efficiency. In addition, the dummy for the public sector bank has positive impact on the efficiency.

3.3 Commercial banking financial indicators and economic growth

The availability of data is very limited in the Nepalese commercial bank hence this study will choose the variables that are deposit, loan and advances and assets over the period 1975 to 2010 were collected from the Nepal Rastra Bank Quarterly Economic Bulletin (published by the Central Bank of Nepal) while RGDP was noted from various issues of Economic Survey [162] of Ministry of Finance and population was taken from the Statistical Pocket Book of central bureau of statistics. Monetary management turned out to be a key concern for the banking sector in Nepal only since 1975 [163] and that is the reason of to consider data from 1975 in this study. Though there are other financial institutions including development banks, finance companies, saving and credit institutions/cooperatives that provide banking and near banking or limited banking activities, still the share of commercial banks on total financial institutions' assets is more than other financial institutes [20]. Therefore, the commercial banks used in this investigation might rightly represent Nepalese banking industry.

3.3.1 Variables specification

Economic growth in Nepal (the explained variable) will be represented by real GDP per capita at constant prices (RGDP). On the other hand, the commercial banking performance is represented by the following explanatory variables. Three variables-total deposits, total loans and advances and total assets – were used.

Deposit

Deposit mobilization as noted by [164] is one of the most important functions of a bank. This function enables banks mobilize deposits which otherwise would have remained idle and unproductive in the hands of the surplus economic unit. This fund so mobilized is then made available to the deficit unit. The main function of the Nepalese commercial banks is to collect the deposit from public and firms and they continued to attract public or firm to offer different types of deposit facility. Therefore, this analysis will try to find out if commercial banks deposits have eventually benefited its economy and economic activities. For this proxy used the total deposit of commercial banks (current, saving and fixed).

Loan

Primary function of commercial banks is the deposit mobilization and credit creation ability of banks [165]. This proxy is defined as total amount of loan of the commercial banks, which represents an important capital source in Nepal. So it is often regarded as an essential service to push the economic growth, which has a close relationship with economy. Therefore, loan will be implemented.

Assets

This study also uses the banking sector assets to assess the impact of the size of banking sector on economic growth. Commercial banks assets have eventually effect of economic activities or not.

Gross domestic product

The gross domestic product (GDP), a basic measure of an economy's economic performance, is the market value of all final goods and services made within the borders

of a nation in a year. GDP can be defined in three ways, all of which are conceptually identical. First, it is equal to the total expenditures for all final goods and services produced within the country in a stipulated period of time (usually a 365-day year). Second, it is equal to the sum of the value added at every stage of production by all the industries within a country, plus taxes less subsidies on products, in the period. Third, it is equal to the sum of the income generated by production in the country in the period—that is, compensation of employees, taxes on production and imports less subsidies, and gross operating surplus (or profits).

3.3.2 Model description and methodology for economic growth

After selection of the above variables, we can describe the financial indicators and economic growth of the Nepal in the following way:

In formulating model, this study assumes that the RGDP (real gross domestic product) is a function of deposit, loan and commercial banks assets. All the variables will be measured in log (LN) value. Given the above theoretical considerations, the behavioral equation of the model will be formulated as follows: RGDP = f (Deposit, Loan, and Asset).

Equation 3-15 could be written in the following form:

$$\ln(RGDP) = \beta_0 + \beta_1 \ln(Deposit) + \beta_2 \ln(Loan) + \beta_3 \ln(Asset) \tag{3-15}$$

All the independent variables will be expected to have a positive impact on economic growth. Within the context of this paper, real GDP per capita was interpreted as economic growth.

This research will be based on the following hypothesis that clearly defines the research criterion.

H1 – There is a significant relationship between commercial banks deposit and economic growth.

H2 – There is a significant relationship between commercial banks loan and economic growth.

H3 – There is a significant relationship between commercial banks assets and economic growth.

After linking the commercial banking financial indicators (Deposit, Credit and Assets) with economic growth, it is also imperative to analyze the relationship of ROA, ROE, NPL, CAR, CDR, PEFFI and TEFFI with RGDP for the period of 2005 to 2010. We hypothesized the risk factors and efficiencies with the economic growth based on panel data.

H1 – There is a significant relationship between Return on assets and economic growth.

H2 – There is a significant relationship between Return on equity and economic growth.

H3 – There is a significant relationship between Nonperforming loan and economic growth.

H4 – There is a significant relationship between Capital adequacy ratio and economic growth.

H5 – There is a significant relationship between Credit to deposit ratio and economic growth.

H6 – There is a significant relationship between technical efficiency under Intermediation approach and economic growth.

H7 – There is a significant relationship between technical efficiency under profit oriented approach and economic growth.

3.3.2.1   Unit root test

A test of stationarity (or non-stationarity) that has become widely popular over the past several years is the unit root test. There are different types of unit root tests available. The most famous and reliable test is know as Augmented Dickey-Fuller. Others are Phillips-Perron , GLS-detrended Dickey-Fuller, Kwiatkowski, Phillips, Schmidt, and Shin , Elliott, Rothenberg, and Stock Point Optimal , and Ng and Perron unit root tests.

The simplest way to understand the unit root test is:

Consider a simple AR (1) process:

$$y_t = py_{t-1} + x_t'\delta + \varepsilon_t, \qquad (3-16)$$

where x_t are optional exogenous regressors which may consist of constant, or a constant and trend, p and δ are parameters to be estimated, and the ε_t are assumed to be white noise. If $|p| \geq 1, y$ is a non-stationary series and the variance y of increases with time and approaches infinity. If $|p| < 1, y$ is a (trend-) stationary series. Thus, the hypothesis of (trend-) stationarity can be evaluated by testing whether the absolute value of p is strictly less than one.

3.3.2.2   Augmented Dickey Fuller test

In order to avoid the possibility of biased results emanating from a likely existence of unit roots in the variables under study, the researcher performed stationarity using the ADF (Augmented Dickey Fuller) test procedure. The standard Dickey Fuller test can be carried out by estimating equation after subtracting y_{t-1} from both sides of the equation:

$$\Delta y_t = \alpha y_{t-1} + x_t'\delta + \varepsilon_t, \qquad (3-17)$$

where $\alpha = p - 1$. The null and alternative hypotheses may be written as,

$$H_0 : \alpha = 0$$

$$\qquad (3-18)$$

$$H_1 : \alpha < 0$$

and evaluated using the conventional -ratio for :

$$t_{\alpha} = \hat{\alpha} / (se(\hat{\alpha}))$$ (3-19)

where $\hat{\alpha}$ is the estimate of, and $se(\hat{\alpha})$ is the coefficient standard error.

Dickey and Fuller show that under the null hypothesis of a unit root, this statistic does not follow the conventional Student's *t*-distribution, and they derive asymptotic results and simulate critical values for various test and sample sizes. More recently, MacKinnon implements a much larger set of simulations than those tabulated by Dickey and Fuller. In addition, MacKinnon estimates response surfaces for the simulation results, permitting the calculation of Dickey-Fuller critical values and -values for arbitrary sample sizes.

The simple Dickey-Fuller unit root test described above is valid only if the series is an AR (1) process. If the series is correlated at higher order lags, the assumption of white noise disturbances ε_t is violated. The Augmented Dickey-Fuller (ADF) test constructs a parametric correction for higher-order correlation by assuming that the y series follows an $AR(p)$ process and adding p lagged difference terms of the dependent variable y to the right hand side of the test regression:

$$\Delta y_t = \alpha y_{t-1} + x_t'\delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + ...\beta_p \Delta y_{t-p} + v_t,$$ (3-20)

An important result obtained by Fuller is that the asymptotic distribution of the -ratio for is independent of the number of lagged first differences included in the Augmented Dickey-Fuller regression. Moreover, while the assumption that follows an autoregressive (AR) process may seem restrictive, Said and Dickey demonstrate that the Augmented Dickey-Fuller test is asymptotically valid in the presence of a moving average component, provided that sufficient lagged difference terms are included in the test regression.

3.3.2.3   Regression analysis

In statistics, regression analysis is a collective name for techniques for the modeling and analysis of numerical data consisting of values of a dependent variable (also called response variable or measurement) and of one or more independent variables (also known as explanatory variables or predictors). The dependent variable in the regression equation is modeled as a function of the independent variables, corresponding parameters ("constants"), and an error term. The error term is treated as a random variable. It represents unexplained variation in the dependent variable. The parameters are estimated to give a "best fit" of the data. Most commonly, the best fit is evaluated by using the least squares method, but other criteria have also been used.

Regression can be used for prediction (including forecasting of time-series data), inference, and hypothesis testing, and modeling of causal relationships. The uses of regression rely heavily on the underlying assumptions being satisfied. Regression analysis has been criticized as being misused for these purposes in many cases where the appropriate assumptions cannot be verified to hold. One factor contributing to the misuse of regression is that it can take considerably more skill to critique a model than to fit a model.

3.3.2.4   Granger causality test

The Granger-causality test was used to investigate direction of causation between commercial banks financial indicators and economic growth. The outcome from the Granger-causality test was used to determine whether the variables under study can be used to predict each other or not. Granger causality test is a technique for determining whether one time series useful in forecasting another. Ordinarily, regressions reflect "mere" correlations, but Clive granger, who won

Granger causality really implies a correlation between the current value of one variable and the past values of others: it does not mean changes in one variable cause changes in another. A time series X is said to Granger-cause Y if it can be shown, usually through a series of F-tests on lagged values of X(and with lagged values of Y

also known),that those X values provide statistically significant information about future values of Y. The test works by first doing a regression of ΔY. Once the appropriate lag interval for Y is proved significant (t-stat or p-value), subsequent regressions for lagged levels of ΔX are performed and added to the regression provided that they 1) are significant in and of themselves and 2) add explanatory power to the model. This can be repeated for multiple ΔXs (with each ΔX being tested independently of other ΔXs, but in conjunction with the proven lag level of ΔY).More than one lag level of a variable can be included in the final regression model, provided it is statistically significant and provided explanatory power.

The researcher is often looking for a clear story, such as x granger-causes Y but not the other way around. In practice, however results are often hart-to-interpret. For instance, no variable ganger-causes the other, or that each of the two variables granger-causes the second. By using an F-test to jointly test for the significance of the lags on the explanatory variables, this in effect tests for 'Granger causality' between these variable. It is possible to have causality running from variable X to Y, but not Y to X；from Y to X, but not X to Y and from both Y to X and X to Y, although in this case interpretation of the relationship is difficult. The 'Granger causality' test can also be used as a test for whether a variable is exogenous i.e. If no variables in a model affect a particular variable it can be views as exogenous.

3.4 Data collection

This thesis analyzes 18 Nepalese commercial banks over the six fiscal years of 2005-2010. The commercial banks, which were established before 2005, were only selected in this analysis in order to ensure comparability of the considered banks. Many literatures suggest the use of homogeneity conditions for decision-making units in a model [55] and encourage the use of DEA for firms with similar resources and operations providing similar products and services [166]. Therefore, commercial banks that started its operations after 2005 are not included in this investigation. The determinants of commercial banking efficiency will be investigated based on Panel data with 108

observations. All the variables will be measured in percentage except Size, which will be considered in Nepalese Rupees, and for ownership, we will use dummy variable. The required data will be mainly obtained from the Nepal Rastra Bank Bulletin (published by the Central Bank of Nepal), annual audited financial statements of the commercial banks (published by the respective banks).

Efficiency scores were estimated with MATLABR2010a program whereas the ordinary calculations were done in Excel. The statistical software E-views7 has performed all the calculations for Tobit regression analysis.

In order to investigate the relation between financial indicators of the Nepalese commercial banks with economic growth the data will be collected from 1975 to 2010 and show the financial risk factors and efficiency the data will be collected from 2005-2010.

All the estimations for Unit Root test，Ordinary Least Square, and Granger Causality test have been performed in the E-Views7 program whereas the ordinary calculations will be done in Excel.

3.5 Chapter summary

This chapter summarizes the methodological approaches that will be taken to find out Bank performance and efficiency using CAMEL Model, DEA Model in the Nepalese commercial banking sector over the period from 2005 to 2010. Ordinary least square has been used to link the relation between financial indicators with economic growth in the Nepalese banking sector over the period from 1975 to 2010. We commenced this Chapter by outlining a CAMEL Model and Multiple regression Method which determine the banking performance and show the relationship between banking sectoral factors and profit of the commercial banks of Nepal. This study investigated the efficiency of commercial banks of Nepal as well. The DEA methodology has been used to estimate technical efficiency for the Nepalese commercial banks. With regard to the find out the technical efficiency, this study use both approach intermediation and profit oriented approach and compare the efficiency

under both approach. This study also employed the Tobit regression model and efficiency scores computed using the DEA models, to further explore the possible drivers of Nepalese commercial banking efficiency. Furthermore, investigate the relationship between financial indicators with economic growth using ordinary least square method and granger causality test.

Chapter 4 Financial performance evaluation of

Nepalese commercial banks

The purpose of this section is to discover the current states of the Nepalese commercial banks and major factors of the profitability of the banks so that management and the public can identify the most critical problems inside each bank and develop ways to deal with those problems. In order to identify the relevant factors influencing the commercial banking performance (namely return on assets and return on equity), this part of the study concentrated on bank-specific factors based on the CAMEL framework by determining capital adequacy ratio, non-performing loan ratio, interest expenses to total loan ratio, net interest margin ratio and credit to deposit ratio for the individual and ownership types Nepalese commercial banks. Furthermore, the relationship between bank specific factors and the profitability ratios has been established with econometric model (multivariate regression analysis) by formulating two regression models.

4.1 Ratio analysis of individual banks

This section of the study aimed at establishing the general trend of profitability and the five banking-sectoral factors in the Nepalese commercial banking sector from 2005 to 2010.

4.1.1 Return on assets

Public sector commercial banks are largely controlling Nepalese commercial banking sector. In recent years, the performance of the banking system is satisfactory in

terms of net profit. No public Banks went into net operating loss. Return on Assets for the public sector banks, on an average, during the period of 2005 to 2010.

Table 4-1 Return on assets of public sector banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NBL	3.68	3.36	0.58	0.57	1.88	1.00	1.84
RBBL	3.76	3.99	3.50	3.32	3.08	2.39	3.34
ADBL	-0.25	2.04	2.77	1.53	2.04	3.50	1.94
Average							2.37

In order to rank the banks based on this ratio, RBBL bank is the first one, it has an average of ROA 3.34%.The second position is for ADBL bank with ROA equals to 1.94%. Over the period showing a positive trend except F.Y. 2005 ADBL a Negative by -0.25% and the last position is belonged to NBL bank With ROA equals to 1.84%.As per the Conventional rules, ROA of commercial banks should fall in the range of less than 3 and equal to 2 in order to be satisfactory earning performance [38]. From the above analysis, the net profit to total assets ratio of RBBL bank to gain profit seems most attractive due to proper mobilization of available resources other public banks has appeared better position.

Table 4-2 Return on assets of joint venture banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NABIL	3.02	2.84	2.47	2.01	2.35	2.19	2.48
SCBL	2.43	2.56	2.42	2.46	2.53	2.70	2.51
HBL	1.17	1.55	1.47	1.76	1.91	1.19	1.51
NSBI	0.55	0.90	1.83	1.44	1.02	1.03	1.13
NBBL	5.65	-15.35	-14.63	6.35	18.04	8.15	1.37
EBL	1.45	1.49	1.38	1.66	1.73	2.01	1.62
Average							1.77

During the period 2005 to 2010, ROA for the joint venture banks, on an average, In order to rank the banks based on this ratio, SCBL bank is the first one, it has an average of ROA 2.51%.The second position is for NABIL bank with ROA equals to 2.48%. It seems most of the larger banks mobilize their available resources more effectively than smaller banks.

Table 4-3 Return on assets of domestic private banks

Bank	Value in percentage						Average
	2005	2006	2007	2008	2009	2010	
NIBL	1.43	1.64	1.82	1.79	1.7	2.21	1.76
BOK	1.42	1.65	1.8	2.04	2.25	2.18	1.89
NCCBL	0.07	-8.86	-1.92	6.05	3.92	3.32	0.43
LBL	-4.38	-1.88	3.37	5.33	4.4	4.1	1.82
NIC	1.52	0.93	1.36	1.6	1.69	2.21	1.55
MPBL	1.31	1.48	0.71	0.68	0.7	0.35	0.87
KBL	1.18	1.15	1.43	1.16	1.41	1.54	1.31
LXBL	0.69	0.68	0.76	0.95	1.03	1.56	0.95
SBL	2.27	1.37	1.2	1.23	1.22	1.06	1.39
Average							1.33

Domestic private banks came in operation by late 1990s and early 2000s. Domestic private banks are relatively small in asset size as well as their network. During the period of 2005 to 2010. Return on Assets for the Domestic private banks, on an average, In order to rank the banks based on this ratio, Lumbini Bank Ltd (LBL) is first one, it has an average of ROA 1.82%. The second position is for Nepal Industrial and commercial Bank Ltd (NIC) with ROA equals to 1.55% and the last position is belong Nepal Credit and Commerce Bank Ltd (NCCBL) with ROA equals to 0.43%. If ROA is less than 1 fall in the marginal earning performance zone (Baral, 2005).Here, Machhapuchhre Bank Ltd (MPBL), NCCBL and Laxmi Bank Ltd (LXBL) is Margin level. It seems small number of assets unable to generate more because of the lack of proper utilization of its available resources.

4.1.2 Return on equity

Table 4-4 Return on equity of public sector banks

Bank	Value in percentage						Average
	2005	2006	2007	2008	2009	2010	
NBL	-23.30	-19.16	-3.63	-3.98	-18.42	-8.83	-12.89
RBBL	-6.55	-8.50	-9.39	-11.44	-15.30	-23.33	-12.42
ADBL	1.31	-86.00	83.14	12.54	10.24	17.41	6.44
Average							-6.29

Two Public sector Banks are huge negative net worth and going fluctuating trend during the period 2005 to 2010.Among three, public Banks ADBL is in positive trend over the period except in F.Y.2006. The average ROE ratio is -12.89% for NBL Bank, -12.42% for RBBL Bank and 6.44% for ADBL. It seems ADBL is efficiently utilizing its shareholders fund in generating profit. Higher ratio indicates better utilization of its fund.

Table 4-5 Return on equity of joint venture banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NABIL	31.29	33.88	32.76	30.63	32.94	29.69	31.87
SCBL	34.07	37.55	32.68	32.85	33.58	32.22	33.83
HBL	20.86	25.90	22.91	25.30	24.13	14.79	22.32
NSBI	8.33	11.91	21.91	17.51	18.47	15.99	15.69
NBBL	-319.53	115.01	40.45	-27.22	194.03	47.87	8.44
EBL	22.19	26.37	24.67	23.49	28.99	30.15	25.98
Average							23.02

The Average ROE ratios for the joint venture banks stood positive over the period 2005-2010. In order to rank the banks based on this ratio, NCCBL bank is the first one, it has an average of ROE 57.25%. The second position is for SCBL bank with ROE equals to 33.83%, and the last position is belonged to Nepal Bangladesh Bank Ltd (NBBL) With ROE equals to 8.44%. It seems Joint venture banks are earning profit and are in satisfactory position.

Table 4-6 Return on equity of domestic private banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NIBL	19.67	24.76	26.7	25.93	23.05	27.61	24.62
BOK	19.36	24.11	26.42	26.94	26.51	24.56	24.65
NCCBL	-2.02	184.36	22.72	72.8	37.81	27.83	57.25
LBL	-80.31	11.09	-44.78	38.43	34.86	20.89	-3.31
NIC	16.63	12.60	17.25	18.65	19.12	25.49	18.29
MPBL	13.31	14.39	7.62	7.31	7.25	4.13	9.00
KBL	13.62	12.00	16.60	12.82	16.09	17.73	14.81
LXBL	4.11	5.21	7.59	10.38	14.07	17.10	9.74
SBL	18.12	10.82	12.01	13.40	17.04	15.02	14.40
Average							18．82

The average ROE of all Banks are going positive except LBL. In order to rank the banks based on this ratio, NIC bank is the first one, it has an average of ROE 18.29%. The second position is for Siddhartha bank Ltd (SBL) bank with ROE equals to 14.40%, and the last position is belonging with LBL bank With ROE equals to -3.31%. It seems Domestic Private Banks are efficiently uses their shareholder's fund and earning net profit in satisfactory level.

4.1.3 Non-performing loan ratio

It is obvious from the theoretical prescription that the performance of commercial banks largely depends on the quality of assets held by them, and quality of the assets relies on the financial health of their borrowers. As stated earlier, many indicators can be used to measure the quality of assets held by commercial banks. However, here, only one simple indicator – non-performing loan ratio used to measure the quality of assets being held by banks. The increasing trend of this ratio shows the deteriorating quality of commercial bank assets.

Table 4-7 Non performing loan ratio of public sector banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NBL	49.64	18.18	13.49	12.38	4.94	4. 98	17.27
RBBL	50.7	37.09	28.63	21.43	15.64	9. 78	27.21
ADBL	19.81	20.59	17.96	11.69	9.71	8. 36	14.69
Average							19.72

In the FY 2005-2010, the average NPL ratio is 17.27% for NBL, 27.21% for RBBL Bank and 14.69% for ADBL. During the study period, it had shown some sign of improvement. It was in decreasing order. The ratio of NPL in the Public bank is very high when compared with the joint venture Banks and Domestic Private Banks. The share of public sector banks in NPL is extremely high because Poor appraisal, and inadequate follow-up and supervision of loan distribution eventually resulted in massive booking of poor-quality assets, the level of which remains high.

Table 4-8 Non performing loan ratio of joint venture banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NABIL	1.32	1.38	1.12	0.74	0.8	1.47	1.14
SCBL	2.69	2.13	1.83	0.92	0.66	0.61	1.47
HBL	7.44	6.6	3.61	2.36	2.16	3.52	4.28
NSBI	6.54	6.13	4.56	3.83	2.02	1.48	4.09
NBBL	19.04	27.12	39.76	31.73	19.8	6.47	23.99
EBL	1.63	1.27	0.8	0.68	0.48	0.16	0.84
Average							5.97

During the study period 2005-2010 average ratio of NBBL and NCCBL is very high these two banks are not satisfactory level. Other joint venture banks on the average are at satisfactory level, but they are far below the aggregate percentage of non-performing assets of commercial banks. NPL indictors show that joint venture banks are improving the quality of their assets year by year. Overall, both NPL imply the sound financial health of the joint venture banks.

During the study period 2005-2010 average NPL ratio of LBL and NCCBL are more then other domestic private banks. Other Domestic private Banks on the average is at satisfactory level.

Table 4-9 Non performing loan ratio of domestic private sector banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NIBL	2.69	2.07	2.37	1.12	0.58	0.62	1.58
BOK	4.99	2.72	2.51	1.86	1.27	1.51	2.48
NCCBL	8.6	21.9	31.4	16.42	8.6	2.88	14.97
LBL	15.23	30.99	20.37	14.92	9.06	4.53	15.85
NIC	3.78	2.6	1.11	0.86	0.23	0.72	1.55
MPBL	0.39	0.28	1.16	1.04	2.33	2.32	1.25
KBL	0.95	0.92	0.73	1.32	0.44	0.50	0.81
LXBL	1.63	0.78	0.35	0.13	0.08	0.12	0.52
SBL	2.58	0.87	0.34	0.69	0.45	0.53	0.91
Average							4.44

However, the banks NPL ratio is below the aggregate percentage and was in decreasing trend. The declining ratio of NPL had reflected a better quality of their assets year by year.

4.1.4 Interest expenses/total loan

Table 4-10 exhibits IETTL of public sector banks in Nepal for the period 2005-2010. The average IETTL of PSB was 5.65%. Among public sector banks, the IETTL of NBL was higher than other banks because the management of NBL has been under control of the central bank of Nepal and could manage the quality of loans. ADBL (5.31%) management was the least efficient among the sampled public sector banks.

Table 4-10 Interest expenses to total loan of   public sector banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NBL	9.11	7.94	7.00	5.83	4.49	3.25	6.27
RBBL	7.48	5.81	5.44	4.84	4.08	4.58	5.37
ADBL	6.57	6.03	5.89	5.37	3.55	4.45	5.31
Average							5.65

Among joint venture banks, the IETTL of NBBL was higher than other selected banks. It means NBBL could manage the quality of loan than other banks. SCBL secured the last position. The average IETTL of joint venture banks was 4.76%.

Table 4-11 Interest expenses to total loan of joint venture banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NABIL	2.30	3.37	3.57	3.55	4.18	6.07	3.84
SCBL	3.02	3.60	3.93	3.44	3.98	3.61	3.60
HBL	4.52	4.43	4.51	4.22	3.77	5.55	4.50
NSBI	4.16	4.39	4.36	3.76	5.45	8.26	5.06
NBBL	7.04	8.02	9.80	7.29	6.11	6.11	7.39
EBL	3.93	4.10	3.78	3.45	4.24	5.71	4.20
Average							4.76

Among domestic private banks NCCBL's IETTL is higher than other banks .It means NCCBL bank maintain the quality of loan. BOK's IETTL is lesser than other banks. Average IETTL of Domestic private bank was 5.32%.

Table 4-12 Interest expenses to total loan of domestic private banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NIBL	3.50	3.84	3.97	3.68	4.65	6.33	4.33
BOK	4.09	4.67	3.61	3.35	3.84	5.42	4.16
NCCBL	5.83	6.81	7.63	6.31	5.13	7.38	6.51
LBL	6.11	7.22	6.89	5.80	5.31	6.58	6.32
NIC	4.80	5.11	4.71	4.49	5.61	8.10	5.47
MPBL	3.70	4.76	5.58	4.72	4.63	10.11	5.58
KBL	4.29	4.89	4.45	4.40	5.59	8.05	5.28
LXBL	4.46	4.54	4.35	4.36	5.35	7.80	5.14
SBL	3.58	4.06	4.37	4.37	6.10	8.45	5.15
Average							5.32

4.1.5 Net interest margin

Table 4-13 provides the trend of the net interest margin of the studied banks. Here all Public Sector banks Net Interest Margin were positive and increasing consistently. Except in 2007, ADBL's Net interest margin is negative. Among Public sector banks. ADBL's Net interest margin is higher than others are it means ADBL's Earning performance is better than other banks due to large scale of branch.

Table 4-13 Net interest margin of   public sector banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NBL	2.63	3.55	2.74	3.14	3.99	4.88	3.49
RBBL	3.76	3.59	3.07	3.16	3.55	3.35	3.41
ADBL	7.78	7.35	-0.05	5.31	5.93	7.32	5.61
Average							4.17

Table 4-14 Net interest margin of joint venture banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NABIL	4.80	4.27	3.78	3.29	3.75	4.01	3.98
SCBL	3.63	3.44	4.76	3.36	3.31	3.65	3.69
HBL	3.17	3.32	0.19	3.15	3.58	3.73	2.86
NSBI	3.09	2.87	4.10	3.00	2.06	2.17	2.88
NBBL	2.47	2.05	9.82	4.58	7.75	1.82	4.75
EBL	3.56	3.15	1.41	3.37	3.18	3.70	3.06
Average							3.53

Among Joint venture banks, NBBL net interest margin is higher than other banks. NSBI net interest margin is lower than other banks. Average Net Interest margin of joint venture banks was 3.53%.

Table 4-15 Net interest margin of domestic private banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NIBL	3.27	3.2	2.63	3.09	2.98	3.66	3.14
BOK	3.71	3.91	0.93	3.48	3.83	4.14	3.33
NCCBL	3.02	3.84	2.91	3.61	3.84	3.54	3.46
LBL	4.25	3.01	8.08	4.48	4.19	0.55	4.09
NIC	3.08	2.31	2.34	2.79	2.75	3.67	2.82
MPBL	3.02	3.00	3.64	3.11	2.64	1.18	2.77
KBL	3.49	2.98	0.62	3.05	3.01	3.32	2.75
LXBL	2.51	2.47	2.34	2.28	2.1	3.11	2.47
SBL	3.43	3.19	3.00	2.76	2.53	-3.49	1.90
Average							2.97

The study recommends that banks should look for better and more ways of investing their funds in order to gain larger net interest margins. Among Domestic Private Banks LBL Banks net interest margin is higher than other banks It means LBL bank was able to maintain good asset quality. SBL banks NIM was least among the domestic private banks. The average NIM for domestic private bank was 2.97.

4.1.6 Credit to deposit ratio

The credit / deposit ratio is a major tool to examine the liquidity of a bank. CDR ratio measures the ratio of fund that a bank has utilized in credit out of the Deposit total collected. More the CDR ratio more the effectiveness of the bank to Utilize the fund it collected

Table 4-16 Credit to deposit ratio of public sector banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NBL	46.94	34.72	35.26	37.69	43.28	59.52	42.9
RBBL	62.77	50.32	49	47.26	46.37	51.90	51.27
ADBL	115.01	112.42	106.24	112.44	108.93	121.90	112.82
Average							69.00

As per the Table 4-16, the CDR ratios of the Public banks, shows that, their liquidity position is very low then accepted level. However, ADBL is seems to more efficient to utilize then funds collected as deposit. During the study period, the average CDR ratio of NBL 39.58%, 51.14% and ADBL is 111.01%. Although there is not any standard for CDR Ratios in Nepal, a ratio of 75% can be accepted to be adequate.

Table 4-17 Credit to deposit ratio of joint venture banks

Banks	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NABIL	75.05	68.63	68.13	68.18	73.87	69.37	70.54
SCBL	43.49	39.92	43.78	46.95	38.7	45.98	43.14
HBL	50.07	55.27	56.57	61.23	71.49	74.39	61.5
NSBI	77.87	69.32	82.66	88.32	55.84	51.48	70.92
NBBL	79.39	75.27	96.91	87.01	91.33	78.26	84.7
EBL	78.24	73.40	77.40	79.00	73.43	74.61	76.01
Average							67.80

As per the above table, the CDR ratio of the bank is quite consistent over the past five years beginning from FY 2004/05 to FY 2009/10.

Table 4-18 Credit to deposit ratio of domestic private banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NIBL	73.33	69.63	72.56	79.91	78.86	81.74	76.01
BOK	68.87	71.42	78.25	80.51	82.65	83.90	77.6
NCCBL	90.66	89.12	78.80	72.14	90.66	77.49	83.15
LBL	91.41	90.29	82.07	94.1	88.15	95.23	90.21
NIC	78.66	78.74	90.67	87.62	89.32	80.97	84.33
MPBL	91.83	77.87	77.25	81.00	83.00	80.78	81.96
KBL	90.62	90.2	85.84	92.00	94.17	79.45	88.71
LXBL	89.33	96.3	85.78	89.72	83.88	81.49	87.75
SBL	104.42	98.75	95.39	93.03	85.18	83.65	93.40
Average							84.79

Among the joint venture banks Everest Bank Ltd (EBL) average CDR ratio is higher then other JV Banks. In an average, the bank has been able to utilize the depositors fund in the form of credit.

During the study period, the Credit Deposit ratios of Domestic private banks were accepted level. The Domestic private Banks CDR ratio is higher than 75% level, which is adequate. In order to rank the banks, SBL average CDR ratio is the first one, it has an

average of 93.35%. The second position is for LBL bank with CDR equals to 90.21%, and the last position is belonged to NIBL bank With CDR equals to 76.01%.It seems Domestic Private Banks are efficient to utilize the funds collected as deposit.

4.1.7 Capital adequacy ratio

As stated in the foregoing analysis, banks under study are well capitalized and they are complying with the directive of NRB on capital adequacy ratio. However, their capital base relative to the risk-weighted assets is not so strong. According to the international rating convention, total capital should be greater than 19.5 percent of the total risk weighted assets of commercial banks in order to be a strong capital base. But none of the banks under study has the capital fund greater than 19.5 percent of the total risk weighted capital. On the average, capital adequacy of joint venture banks is fair during the study period. Total capital adequacy ratio less than 15 and equal to 12 indicates that capital adequacy is fair and on the average, this ratio falls within this range.

Table 4-19 Capital adequacy ratio of public sector banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NBL	-29.53	-43.09	-38.83	-35.46	-13.94	-11.74	-28.77
RBBL	-33.76	-55.54	-43.53	-37.19	-38.37	-24.08	-38.75
ADBL	-15.5	-2.07	4.84	11.41	15.69	19.19	5.59
Average							-20.64

The average capital adequacy ratio of two public banks NBL and RBBL is negative due to the heavy accumulated losses. Due to the inherent problems and big chunk of NPA, the public sector banks suffered from massive losses in the past, which had heavy impact on their capital adequacy. Although, the public banks had started to improve their financial condition, it is very different from an acceptable standard. However, ADBL capital adequacy ratio is seems to be positive but ADBL is also not meet the NRB requirement.

Table 4-20 Capital adequacy ratio of joint venture banks

Bank	Value in Percentage						
	2005	2006	2007	2008	2009	2010	Average
NABIL	12.44	12.31	12.04	11.1	10.7	10.50	11.52
SCBL	16.06	14.93	15.71	13.15	14.7	14.60	14.86
HBL	11.01	11.26	11.13	13	11.02	10.72	11.36
NSBI	9.47	13.57	13.29	12.32	11.92	12.25	12.14
NBBL	3.35	-13.48	-23.55	-18.17	5.55	12.81	-5.58
EBL	13.54	12.32	11.2	11.44	10.55	10.77	11.64
Average							9.32

During the study period, most of the joint venture banks have met the capital adequacy ratio as directed by NRB in the FY 2004/05 and FY 2009/10. The banks with non-compliance were NBBL (-5.58). In addition, average capital fund ratio of joint venture banks during the study period above 10%. This is higher than the minimum ratio specified by NRB. This clearly implies that joint venture banks are complying with the directive of NRB on the requirement of the capital base of commercial banks.

Table 4-21 Capital adequacy ratio of domestic private banks

Bank	Value in percentage						
	2005	2006	2007	2008	2009	2010	Average
NIBL	11.58	11.97	12.17	11.28	11.24	10.55	11.47
BOK	11.02	14.52	12.62	11.94	11.68	10.85	12.11
NCCBL	4.2	-3.46	-9.14	10.53	11.07	13.94	4.52
LBL	6.93	-15.11	-7.8	6.00	17.78	24.62	5.4
NIC	13.29	13.54	12.2	13.11	12.42	12.92	12.91
MPBL	11.36	12.79	11.97	12.29	11.84	11.24	11.92
KBL	11.21	12.36	11.22	14.41	11.56	12.34	12.18
LXBL	20.88	14.96	12.43	11.17	11.48	13.71	14.11
SBL	13.65	14.16	11.84	11.14	10.39	10.04	11.87
Average							10.72

FY 2004/05 to 2009/10, Most of the Domestic private banks had complied with the statutory capital adequacy ratio of 10 %. The banks with non-compliance were LBL (5.4%). As transactions of the bank increases, the risk weighted assets also increases in the same manner. However, this creates bank difficulty to maintain capital fund as required by the NRB as often capital do not increase and the performance of the bank (i.e. earning of profit) has major role to play to comply with the NRB requirements. As

such, it is evident that the Domestic private bank has been performing well enough to comply with the NRB requirement without failure at any point of time except LBL.

4.2 Average ratio of ownership structure

4.2.1 Profitability

In this study, the position of profitability has been measured with the help of return on assets and return on equity. Return on assets (ROA) is a comprehensive measure of overall bank performance from an accounting perspective [167]. Table 4-22, column 1 depicts average ROA of major commercial banks in Nepal for the period 2005 - 2010. The average ROAs of all the premeditated banks have been estimated positive demonstrates that in the recent years, the performance of the banking system in Nepal is reasonable in terms of net profit. The average ROA of PSB (2.37%) was found higher than that of JVB (1.77%) and DPB (1.33%) due to having utmost total assets. The earning performance of PSB was satisfactory and no public banks were suffered from net operating loss. Among the public sector banks, the average ROA of RBBL bank was determined 3.34% with positive trend during the study period. The net profit to total assets ratio of RBBL bank to gain profit seemed most attractive due to proper mobilization of available resources than other public banks has appeared better position. The second position was for ADBL bank with average ROA equaled to 1.94%. Over the study period, there was a positive trend in ROA. The last position was belonged to NBL bank with average ROA equaled to 1.84% but ROA values computed during the study period were found positive. SCBL was maintained first place with ROA equaled to 2.51% among joint venture banks, while the second position was for NABIL bank (2.48%) and the last position was belonged to NSBI (1.13%). The average ROA of BOK was noted 1.89% and this bank was ranked first position among the domestic private banks. The second position was for LBL bank with ROA equaled to 1.82% and the last position was belonged to NCCBL with ROA equaled to 0.43%. The average ROAs of NCCBL (JVB), MPBL (DPB) and LXBL (DPB) were estimated less than 1 fall in the marginal earning performance [38]. As ROAs of the most of the larger banks

were estimated greater than those of the smaller banks, it can be concluded that the larger banks were successful in mobilizing their available resources more effectively. Furthermore, availability of limited number of assets restricts the proper utilization of resources and ultimately the earning profit.

The ROE of the major commercial banks in Nepal are presented for the average of the six years in Table 4-22, column 2. The situation of PSB was most awful with fluctuating and negative ROE trends. The average ROE ratio was -12.89% for NBL, -12.42% for RBBL and 6.44% for ADBL. This implies that the shareholders receive very low returns in terms of dividend. The ROE of ADBL was only estimated in positive among the three public banks. It seems ADBL was efficiently utilizing its shareholders' funds. The average ROEs for the JVB were noted better than PSB and stood positive over the period 2005-2010. In order to rank the JVBs based on this ratio, SCBL was the first one; it has an average ROE of 33.83%. The second position was for NABIL with ROE equaled to 31.87%, and the last position was belonged to NBBL with ROE equaled to 8.44%. It shows that JVB had satisfactory earning profit and the shareholders earn better return on their investment. The average ROEs of all DPB were going positive except that of LBL. In order to rank the banks based on this ratio, NCCBL was the first one. It had an average ROE of 57.25%. The second position was for BOK with ROE equaled to 24.65%, and the last position was belonging with LBL with ROE equaled to -3.31%. It shows DPBs were efficiently use their shareholders' funds and earning net profit in satisfactory level.

4.2.2 Capital adequacy

As stated in the foregoing analysis, banks under study are well capitalized and they are complying with the directive of NRB on capital adequacy ratio. However, their capital base relative to the risk-weighted assets is not so strong. According to the international rating convention, total capital should be greater than 19.5% of the total risk weighted assets of commercial banks in order to be a strong capital base. However, none of the banks under study had the capital fund greater than 19.5% of the total risk weighted capital. As indicated by CAR, on the average, capital adequacy of joint

venture banks was fair during the study period. Total capital adequacy ratio less than 15 and equal to 12 indicates that capital adequacy is fair and on the average, this ratio falls within this range. It is clear from Table 4-22 column 3 that the average capital adequacy ratio of two public banks NBL and RBBL were negative due to the heavy accumulated losses. Due to the inherent problems and big chunk of NPA, the public sector banks suffered from massive losses in the past, which had heavy impact on their capital adequacy. Although, the public banks had started to improve their financial condition, it is very different from an acceptable standard. However, ADBL capital adequacy ratio was seemed to be positive but ADBL was also not achieved the NRB requirement. Most of the joint venture banks have accomplished the capital adequacy ratio as directed by NRB. The banks with non-compliance were NBBL (-5.58%). In addition, average capital fund ratio of joint venture banks during the study period hang around 14%. This was higher than the minimum ratio specified by NRB. This clearly implies that joint venture banks are complying with the directive of NRB on the requirement of the capital base of commercial banks. All the selected domestic private banks had complied with the statutory capital adequacy ratio of 10%. The banks with non-compliance were LBL (5.4%) and NCCBL (4.52%). As transactions of the bank increases, the risk weighted assets also increases in the same manner. However, this creates banks difficulty to maintain capital fund as required by the NRB as often capital do not increase and the performance of the bank (i.e. earning of profit) has major role to play to comply with the NRB requirements. As such, it is evident that the domestic private bank has been performing well enough to comply with the NRB requirement without failure at any point of time except LBL. It means domestic bank has mobilized capital from the stock market; hence, the bank has been capable to sustain the assurance of shareholders and depositors.

4.2.3 Asset quality

Credit risk is one of the most important areas of risk management. It plays an important role mainly for banking institution, which try to develop their own credit risk models in order to increase bank portfolio quality. Among the various risk in bank,

credit risk is the primary cause of bank failure. It is obvious from the theoretical prescription that the performance of commercial banks largely depends on the quality of assets held by them, and quality of the assets relies on the financial health of their borrowers. As stated earlier, many indicators can be used to measure the quality of assets held by commercial banks. Loans are one of the major outputs provided by a bank, but as loan is a risk output, there is always an ex ante risk for a loan to eventually become non-performing [168]. However, here, only one simple indicator – non-performing loan ratio was used to measure the quality of assets being held by the banks. The increasing trend of these ratios shows the deteriorating quality of commercial bank assets. Table 4-22, column 4 depicts that in the period of 2005-2010, the average NPL ratio was 17.27% for NBL, 27.21% for RBBL and 14.69% for ADBL. The ratio of NPL in the public bank was very high when compared with the joint venture banks and domestic private banks. The share of public sector banks in NPL was extremely high accounting that simply indicates the degradation of quality of loans and concentration as well. Among the JV banks, the average NPL ratio of NBBL and NCCBL were very high. These two banks were not satisfactory level. Other joint venture banks on the average were at reasonable level, but they are far below the aggregate percentage of non-performing assets of the commercial banks. NPL indictors show that joint venture banks were improving the quality of their assets year by year. Average NPL ratio of LBL was superior to other domestic private banks. Other domestic private banks on the average were at reasonable level. However, the banks NPL ratio was below the aggregate percentage and was in decreasing trend. The declining ratio of NPL had reflected a better quality of their assets year by year.

4.2.4 Management

The quality of the management will determine the success of a bank or financial institution. A sound management is crucial for the success of any bank or financial institution. The analysis of the quality of a management is based on the experience of the management and their record of accomplishment in terms of their vision and competence in running the bank. Table 4-22, column 5 exhibits average IETTL of major

commercial banks in Nepal for the period 2005-2010.The average IETTL of PSB (16.95%) was found lower than that of JVB (28.72%) and DPB (47.83%) because management of the public sector banks was the least efficient among the sampled commercial banks. However, the joint venture and domestic private sector banks were managed the quality of loans and ensured profit. ADBL (5.31%) management was the least efficient among the sampled public sector banks, whereas EBL (7.39%) management was the most efficient among the joint venture banks, and NCCBL (6.51%) was the efficient among the domestic private sector banks.

4.2.5 Earning

The net interest margin measures how large the spread between interest revenues and interest costs that management has been able to achieve by close control over earning assets and the pursuit of the cheapest sources of funding [169]. NIM has been treated as an extremely important measure to the bank and its minimum value for a healthy bank is considered about 4%. A small change in the interest margin has a huge impact on profitability. Higher NIM is associated with profitable banks by maintaining good asset quality. The public sector banks in Nepal are entirely different from joint-venture banks and private banks. Table 4-22, column 6 indicates that the domestic banks had higher average NIM (26.65%) than that of public banks (12.51%) and joint venture banks (21.30%). It means domestic banks were able to maintain good earning. While comparing the individual banks, the result was very different from the average values. Though ADBL is public sector bank, it was occupied first position with the highest interest margin of 5.61% while SBL, a domestic private bank, was in the last position with lowest interest margin of 1.90%. The interest margin of EBL, a joint venture bank, was 4.75% and ranked in second position. Among the all commercial banks only ADBL, NABIL, EBL and LBL were maintained minimum level. It seems the profitability of the banks in Nepal was not so satisfactory.

4.2.6 Liquidity

The credit to deposit ratio is a major tool to examine the liquidity of a bank and measures the ratio of fund that a bank has utilized in credit out of the deposit total collected. Higher the CDR more the effectiveness of the bank to utilize the fund it collected.

Table 4-22 Average ratio of the commercial banks measuring the banking performance

Bank		Ratios (%)						
		ROA	ROE	CAR	NPL	IETTL	NIM	CDR
PSB	NBL	1.84	-12.89	-28.77	17.27	6.27	3.49	42.9
	RBBL	3.34	-12.42	-38.75	27.21	5.37	3.41	51.27
	ADBL	1.94	6.44	5.59	14.69	5.31	5.61	112.82
	Average	2.37	-6.29	-20.64	19.72	16.95	12.51	69.00
JVB	NABIL	2.48	31.87	11.52	1.14	3.84	3.98	70.54
	SCBL	2.51	33.83	14.86	1.47	4.33	3.14	43.14
	HBL	1.51	22.32	11.36	4.28	3.60	3.69	61.5
	NSBI	1.13	15.69	12.14	4.09	4.50	2.86	70.92
	NBBL	1.37	8.44	-5.58	23.99	5.06	2.88	84.7
	EBL	1.62	25.98	11.64	0.84	7.39	4.75	76.01
	Average	1.77	23.02	9.32	5.97	28.72	21.30	67.80
DPB	NIBL	1.76	24.62	11.47	1.58	4.20	3.06	76.01
	BOK	1.89	24.65	12.11	2.48	4.16	3.33	77.6
	NCCBL	0.43	57.25	4.52	14.97	6.51	3.46	83.15
	LBL	1.82	-3.31	5.4	15.85	6.32	4.09	90.21
	NIC	1.55	18.29	12.91	1.55	5.47	2.82	84.33
	MPBL	0.87	9.00	11.92	1.25	5.58	2.77	81.96
	KBL	1.31	14.81	12.18	0.81	5.28	2.75	88.71
	LXBL	0.95	9.74	14.11	0.52	5.14	2.47	87.75
	SBL	1.39	14.40	11.87	0.91	5.15	1.90	93.4
	Average	1.33	18.83	10.72	4.43	47.83	26.65	84.79

As per the Table4- 22, column7, the CDR of the public banks shows that their liquidity position was lower than the accepted level. However, ADBL was seemed to more efficient to utilize their funds collected as deposit. During the study period, the average CDR of NBL was 39.58% while that of RBBL was 51.14% and ADBL was 111.01%. Although there is not any standard for CDR in Nepal, a ratio of 75% can be accepted to be adequate. The CDR of the bank was quite consistent over the past five years beginning from 2005-2010.

Among the six joint venture banks, the average CDR of NBBL was higher than other JV banks. In an average, the bank has been able to utilize two-third portion of the depositors fund in the form of credit. The CDR of domestic private banks was in the accepted level. The CDR of domestic private banks was higher than 75% level, which is adequate. In order to rank the banks, SBL was the first one; it has an average CDR of 93.04%. The second position was for LBL bank with CDR equaled to 90.21%, and the last position was belonged to NIBL bank with 76.01%. It seems domestic private banks are efficient to utilize the funds collected as deposit.

4.3 Ranking of commercial banks

Different commercial banks had different ranking based on each financial ratio related to ROA, ROE, CAR, NPL, IETTL, NIM and CDR (Table 4-23).

Based on the bank return on assets, the higher rank was for RBBL, which is a public sector bank, SCBL Bank, was the second, which is joint venture bank and the last position, was belonged to NCCBL, a domestic private bank. Based on return on equity NCCBL belonged to first position, SCBL was second Position and the lowest one was NBL.

Based on capital adequacy ratio SCBL was first position, LXBL was second position and last position belonged to RBBL. Based on the NPL ratio, LXBL was first position while KBL was second position and last position belonged to RBBL. Based on interest expenses to total loan, EBL was in the first position; NCCBL was occupied second position while the last position was for LBL. Based on net interest margin, the first position was for ADBL while EBL was occupied the second position and SBL was in the last position.   Based on credit to deposit ratio, ADBL was first position, SBL was second position and last position belonged to NBL.

Table 4-23 Ranks of the commercial banks in Nepal

Bank		Indications						
		ROA	ROE	CAR	NPL	IETTL	NIM	CDR
PSB	NBL	6	18	17	16	4	6	18
	RBBL	1	17	18	18	7	8	16
	ADBL	4	15	13	13	8	1	1
JVB	NABIL	3	3	10	5	17	4	14
	SCBL	2	2	1	7	14	10	17
	HBL	11	7	12	12	18	5	15
	NSBI	15	9	5	11	13	13	13
	NBBL	13	14	16	17	12	12	6
DPB	EBL	9	4	9	3	1	2	11
	NIBL	8	6	11	9	15	11	11
	BOK	5	5	6	10	16	9	10
	NCCBL	18	1	15	14	2	7	8
	LBL	7	16	14	15	3	3	3
	NIC	10	8	3	8	6	14	7
	MPBL	17	13	7	6	5	15	9
	KBL	14	10	4	2	9	16	4
	LXBL	16	12	2	1	11	17	5
	SBL	12	11	8	4	10	18	2

4.4 Correlation

The relationships among the study variables depicted in the model were tested using correlation with ROA and ROE separately with determinants of the bank's profitability ratio，which is presented in Table 4-24 and 4-25 respectively. Results show that ROA was negatively correlated with CAR (-0.478), IETTL (-0.251) and CDR (-0.279) because of heavy accumulated loss and capital below prescribed limit in the public banks in Nepal.

Table 4-24 Correlation between   return on assets and other financial ratios

		ROA	CAR	NPL	IETTL	NIM	CDR
Pearson Correlation	ROA	1.000	-.478	.289	-.251	.314	-.279
	CAR	-.478	1.000	-.825	-.274	-.106	.513
	NPL	.289	-.825	1.000	.302	.268	-.226
	IETTL	-.251	-.274	.302	1.000	.251	.171
	NIM	.314	-.106	.268	.251	1.000	.096
	CDR	-.279	.513	-.226	.171	.096	1.000

Moreover, improper calculation of risk weighed exposure also made CAR to be negatively correlated with ROA. The negative coefficient estimates of the correlation resulted in these ratios had inverse relationship with ROA. In contrast, NPL (0.289) was

positively correlated with ROA depicts that the commercial banks in Nepal could effectively manage its credit risk. NIM (0.314) was also found positively correlated with ROA. The positive coefficient estimates of the correlation implied that there was direct relationship of NPL and NIM with ROA.

Table 4-25 Correlation between return on equity and other financial ratios

		ROE	CAR	NPL	IETTL	NIM	CDR
	ROE	1.000	.619	-.465	-.167	-.009	.177
	CAR	.619	1.000	-.825	-.274	-.106	.513
Pearson	NPL	-.465	-.825	1.000	.302	.268	-.226
Correlation	IETTL	-.167	-.274	.302	1.000	.251	.171
	NIM	-.009	-.106	.268	.251	1.000	.096
	CDR	.177	.513	-.226	.171	.096	1.000

It can be seen that ROE was positively correlated with CAR and CDR. It indicates that an increase in CAR or CDR will lead to an increase in ROE while NPL，IETTL and NIM was found independent with the ROE because NPL, IETTL and NIM were negatively correlated. The coefficient of correlations for CAR (+0.619), CDR (+0.177), NPL (-0.465), IETTL (-0.167), NIM (-0.009) respectively, clearly show that none of the variables were strongly correlated with ROE. The statistics also indicate that none of the variables in both cases was strongly correlated. Hence, there appeared to be no multi co-linearity problems. These have also been verified using Variance Inflation Factor (VIF).

4.5 Regression statistics for the models (A) and (B)

The regression results for the commercial banks including the government, joint venture and domestic private banks are presented in Table 4-26. In the model (A), the value of R-square was 0.621, which means that 62% of the total variation in the value of ROA was due to the effect of the independent variables. The adjusted R square was 0.464. This shows that on an adjusted basis, the independent variables were collectively 46.4 % related to the dependent variable ROA. Durbin-Watson (DW) statistics is the ratio of sum of squares of successive differences of residuals to the sum of squares of errors. As a rule of thumb, if the DW statistic is less than 2, there is evidence of positive

serial correlation [170]. The Durbin-Watson statistic was 2.489; it means that there was no serial correlation between independent variables and ROA. The relationship of the capital adequacy ratio was to be found negative and the coefficients were statistically significant (p< 0.05). The coefficient was -0.055, which depicts that the relationship might not be very strong. However, it is clear that the weak negative relationship was due to the large volume of negative reserves of the two public banks, namely NBL and RBBL. This outcome is in agreement with the findings of [171] for the Pakistani commercial banks. However, Al-Tamini and obeidat [172] found statistically significant positive correlation between the degree of capital adequacy and return on assets in the commercial banks of Jordan. The capital base still was a long way to achieve minimum capital requirement. In other side, NPL ratio was negative but insignificant. It is clear that there was a negative relationship between poor asset quality .This means the commercial banks, which failed to monitor their credit loans tend to be less profitable than those which paid particular attention to the assets quality. IETTL was negatively significant with ROA at 5% level. It means a 0.561 point increase in IETTL will result in an on decrease of 1 point of ROA. The Net interest margin ratio and credit to deposit ratio recognized the positive relationship respectively, whereas NIM statistical coefficients was significantly affected by the performance. NIM will result in an on 0.464 point increase in NIM will result in a increase of 1 point of ROA and the result also exhibit that banks management has been able to keep the growth of interest income ahead of interest expenses. CDR ratio was insignificantly affected. This exposes that increase in the level of credit to deposit significantly increased ROA of the banks by 0.263. CDR was insignificant because the banks were not efficiently utilizing the funds collected as deposit. By analyzing Variance Inflation Factor in ROA model, it can be said that all independent variables had tolerance value greater than 0.1. The results can prove that all variables had Variance Inflation Factor value less than 10.

Table 4- 26 Coefficient analysis and collinearity statistics for the dependent variable ROA.

Model	Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
	B	Std. Error	Beta	T	Sig.	Tolerance	VIF
(Constant)	2.272	.810		2.803	.016		
CAR	-.055	.018	-1.228	-2.989	.011	.187	5.354
NPL	-.047	.027	-.619	-1.726	.110	.245	4.081
IETTL	-.377	.137	-.561	-2.762	.017	.764	1.309
NIM	.362	.150	.464	2.413	.033	.852	1.174
CDR	.010	.009	.263	1.084	.300	.538	1.860
R-squared				0.621			
Adjusted R-squared				0.464			
Durbin-watson stat				2.489			

This finding suggests that multicollinearity was not a problem when selected explanatory variables were used to develop the predicted model in the logistic regression analysis and to validate the evidence presented in correlation matrix.

Table 4-27 in the model (B) indicates that the value of R-square was 0.443, which means that 44.3% of the total variation in the value of ROE was due to the effect of the independent variables. The adjusted R square was 0.211. This shows that on an adjusted basis, the independent variables were collectively 21% related to the dependent variable ROE. The Durbin-Watson statistic was 2.355; it means that there was no serial correlation between independent variables and ROE. The relationship of the CAR with ROE was positively significant at 5% level. In contrast to this outcome, Al-Tamini and obeidat [172] found inverse relationship with statistical significance between the degree of capital adequacy and return on equity in the commercial banks of Jordan. The other variables (NPL, IETTL, NIM, and CDR) were insignificant with ROE. The NPL was insignificant because of the result of poor credit policy including deprived appraisal and inadequate follow-up and supervision of loan distribution eventually. Ramlall [173] has also studied bank-specific determinants of profitability for the Taiwanese banking system and credit risk was found negative and insignificant with ROE. The IETTL and NIM ratio were positive but statistically insignificant. CDR ratio was negative but insignificant because commercial banks are not concentrating more on credit and investment. More credit flows are required to verge on the optimum CDR ratio.

Table 4- 27 Coefficient analysis and collinearity statistics for the dependent variable ROE

Model	Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
	B	Std. Error	Beta	t-stat	Sig.	Tolerance	VIF
(Constant)	19.372	24.677		.785	.448		
CAR	1.177	.560	1.048	2.103	.047	.187	5.354
NPL	.565	.823	.299	.686	.506	.245	4.081
IETTL	1.254	4.160	.074	.301	.768	.764	1.309
NIM	.650	4.566	.033	.142	.889	.852	1.174
CDR	-.293	.278	-.310	-1.054	.313	.538	1.860
R-squared				0. 443			
Adjusted R-squared				0. 211			
Durbin-watson stat				2. 355			

By analyzing Variance Inflation Factor in ROE model, it can be said that all independent variables had tolerance value bigger than 0.1. The results can prove that all variables have Variance Inflation Factor value less than 10. This finding suggests that multicolinearity was not a problem when selected explanatory variables were used to develop the predicted model in the logistic regression analysis and to validate the evidence presented in correlation matrix. The R square for ROA (0.621) was determined higher than ROE (0.443), suggesting the CAMEL framework appears to influence ROA better than ROE.

In ROA model, the result shows that capital adequacy ratio, interest expenses to total loans, net interest margin significant while non-performing loan ratio and credit to deposit ratio were not significant. For that reason, hypothesis 1, 3 and 4 have been accepted and have a significant impact on performance of the commercial banks in Nepal and reject hypothesis 2 and 5 by accepting alternative null hypothesizes. In ROE model, only capital adequacy ratio was significant while other variables non-performing loan ratio, interest expenses to total loans ratio, net interest margin ratio, credit to deposit ratio were not significant. Therefore, hypothesis 1 has been accepted while hypothesis 2, 3, 4 and 5 have been rejected by accepting alternative null hypothesizes.

4.6 Chapter summary

This study has investigated the financial performance of different ownership structured commercial banks in Nepal based on their financial characteristics and identified the bank specific internal factors that affect the profitability of commercial banks in Nepal, measured by return on assets (ROA) and return on equity (ROE). The determinants of bank specific factors exposed by the financial ratios, which were based on CAMEL Model. Eighteen commercial banks for the period 2005 to 2010 were financially analyzed. In addition, econometric model (multivariate regression analysis) by formulating two regression models was used to estimate the impact of capital adequacy ratio, non-performing loan ratio, interest expenses to total loan, net interest margin ratio and credit to deposit ratio on the financial profitability namely return on assets and return on equity of these banks. The results show that public sector banks are significantly less efficient than their counterparts are due to the cause of weak banking supervision and inadequate capital; however, domestic private banks are equally efficient to foreign-owned (joint venture) banks. Banking reform may be needed to modernize the financial services.

Furthermore, the estimation results reveal that return on assets was significantly influenced by capital adequacy ratio, interest expenses to total loan and net interest margin, while capital adequacy ratio had considerable effect on return on equity. The empirical results implied that Nepalese commercial banks should concern capital risk seriously as capital adequacy ratio impinge on both profitability ratios - return on assets and return on equity. It was also investigated that the non-performing loan ratio was negative and insignificant with the both profitability ratios due to poor asset quality or high non-performing loans to total asset. The commercial banks should maintain low non-performing loan in order to obtain higher profit than their counterparts should.

Despite the substantial progress made in terms of improving the performance and competitiveness related with financial system in the country, credit to deposit ratio in some of the big banks namely Nepal bank Ltd, Rastriya Banijaya Bank Ltd and Standard Charted Bank operates with lower ratios. It seems these large banks are not efficient to utilize the funds collected as deposits.

Chapter 5 Technical, pure technical and scale efficiencies under intermediation and profit oriented approach

The success of a commercial bank depends on its ability to operate efficiently in this competitive global market. The objective of this study was to identify factors that contribute to efficiency gains and examine technical, pure technical and scale efficiencies of the Nepalese commercial banks by data envelopment analysis under intermediation and profit oriented approaches using multiple input and output variables. The comparison of the efficiencies under the both approaches has been established as well. In addition, Tobit Model has been exploited to describe the influence of different risk management factors on the estimated efficiencies using quantitative variables such as Return on assets, return on equity, capital adequacy ratio, non-performing loan ratio, credit to deposit ratio, size and qualitative variable considered as ownership.

5.1 Efficiency of commercial banks under intermediation approach

5.1.1 Technical efficiency of the Nepalese commercial banks

The technical efficiency scores of the sampled commercial banks are presented in Table 1. The average annual score for the commercial banks from 2005 to 2010 were determined 80.39%, 83.27%, 88.14%, 91.43%, 83.89% and 76.90%, respectively. It indicates that there was a fluctuating trend in their mean of yearly technical efficiency measures of the commercial banks of Nepal over the study period. These increases

(decreases) in the efficiency could be due to the fact that the commercial banks were becoming more (less) efficient but the ranged values for the technical efficiency of the Nepalese commercial banks were similar to other developing countries around the world [174-175,155].

When turn the analysis to the commercial banks with different ownership structure. The average technical efficiency of JVB (84.48%) and DPB (85.1%) was found higher than that of PSB (79.70%). It shows that the resource employment procedure in JVB and DPB banks is working well than PSB. The same result has also been presented by Ismail [176].He found that joint venture banks are more efficient than the public sector banks for the Malaysian banks. On the other hand, it contradicts the finding of Yildirim [177], which stated that the public sector banks are more efficient than the joint venture and domestic private bank for the Turkish banks.

Table 5-1 Input-oriented technical efficiency (constant return to scale)

| | Bank's Name | Technical Efficiency | | | | | | |
		2005	2006	2007	2008	2009	2010	Average
PSB	NBL	0.564	0.706	0.639	0.796	0.702	1.000	0.734
	RBBL	1.000	0.693	0.665	0.617	0.563	0.588	0.688
	ADBL	0.829	1.000	1.000	1.000	1.000	1.000	0.971
	Average	0.799	0.800	0.768	0.805	0.755	0.863	0.798
JVB	NABIL	1.000	1.000	1.000	0.977	0.822	0.691	0.915
	SCBL	0.890	1.000	1.000	1.000	0.757	0.882	0.921
	HBL	0.662	0.830	0.825	0.894	0.874	0.755	0.806
	NSBI	0.782	0.878	0.965	1.000	0.627	0.513	0.794
	NBBL	0.579	0.575	0.768	0.796	1.000	0.744	0.744
	EBL	0.825	1.000	0.972	0.982	0.807	0.743	0.888
	Average	0.790	0.881	0.922	0.941	0.814	0.721	0.845
DPB	NIBL	0.834	0.965	0.935	0.954	0.821	0.751	0.877
	BOK	0.761	0.895	1.000	1.000	0.909	0.805	0.895
	NCCBL	0.705	0.768	0.665	0.808	0.809	0.705	0.743
	LBL	0.691	0.674	0.725	0.860	0.833	0.844	0.771
	NIC	0.752	0.795	0.950	0.949	0.940	0.759	0.857
	MPBL	0.920	0.323	0.832	0.874	0.859	0.728	0.756
	KBL	0.856	0.913	0.968	0.977	0.994	0.804	0.919
	LXBL	0.821	0.973	0.957	0.975	0.887	0.764	0.897
	SBL	1.000	1.000	1.000	1.000	0.899	0.766	0.944
	Average	0.812	0.892	0.933	0.883	0.770	0.851	0.851
Average		0.804	0.833	0.881	0.914	0.839	0.769	0.804

Among the public sector banks, only ADBL showed the consistency at its efficiency scores i.e. 1 for each year from 2006 to 2010 because the ADBL concerns

with the movements of households' deposits. It made ADBL to be safe. In DEA terminology, such type of the bank is called peer and set an example of good operating practices for inefficient banks to emulate. However, RBBL and NBL had score 1 in 2005 and 2010, respectively, they were treated as inefficient banks because their scores were less than 1 in the rest of the years. Instead of the NBL and RBBL have a large volume of operations and resources in Nepal did not consistent in their performances. This transition can be observed with the fact that, heavy accumulated loss.

As like public sector banks, the technical efficiency scores for the joint venture banks were also found in an inconsistence trend. Although the average technical efficiency of the joint venture banks was higher than the public sector banks, no any joint venture banks had 100% efficiency from 2005 to 2010. NABIL bank in the year from 2005 to 2007 and SCBL bank from 2006 to 2008 showed 100% technical efficiency level among the joint venture banks. It means the production method of the NABIL and SCBL among joint venture banks is relatively adequate with less misuse of the inputs. The analysis of technical efficiency scores demonstrates that the domestic private banks had also the fluctuating trend for their technical efficiencies during the study period. Among the domestic private banks, SBL bank in the year 2005 to 2008 showed 100% technical efficiency level. The average technical efficiency was 81.55%. This means that if the average sampled banks were to achieve the technical efficiency level of its most efficient counterpart, then the average banks could realize about 18.45% saving in their inputs.

Table 5-2 presents the degree of efficiencies for the commercial banks in Nepal. It was shown that no any Nepalese commercial banks obtained 100% technical efficiency during the study period but one PSB (ADBL), two JVBs (NABIL and SCBL) and two DPBs (KBL and SBL) have been categorized as marginal inefficient banks because they have attained TE score above the 90% but less than 100%. It means these banks are functioning at a high level of operating efficiency even though they are not fully efficient. Furthermore, these banks might achieve the status of efficient banks with minute improvements in the resource utilization process. Therefore, the regulators must pay special attention to enhance their efficiency. Among the inefficient banks, RBBL was the most inefficient banks, which scored less than 70%, which is a public sector

bank. As the performance of this bank was the worst among the sampled banks, it can be treated as a target bank. It is significant to note that this bank lacked vitality in terms of the efficiency of resource utilization.

Table 5-2 Distribution of average DEA scores of efficiencies

| Degree of efficiency | No. of Banks | | | | | | | | | | | |
| | Technical efficiency | | | | Pure technical efficiency | | | | Scale efficiency | | | |
	PSB	JVB	DPB	Total	PSB	JVB	DPB	Total	PSB	JVB	DPB	Total
Equal to 100	–	–	–	–	1	–	–	1	–	–	–	–
90-99.9	1	2	2	5	–	3	6	9	3	6	7	16
80-89.9	–	2	5	7	–	3	3	6	–	–	2	2
70-79.9	1	2	2	5	1	–	–	1	–	–	–	–
60-69.9	1	–	–	1	1	–	–	1	–	–	–	–

PSB- Public Sector Bank, JVB - Joint Venture Bank, DPB - Domestic Private Sector Bank;
  – indicates no any bank

5.1.2 Pure technical efficiency of the Nepalese commercial banks

The data envelopment analysis based on the BCC Model was used to account for variable return to scale to analyze the pure technical efficiency of the commercial banks of the Nepal for the period of 2005-2010 reported in Table5-3. In VRS, there was an increase in number of the commercial banks which shows the consistency in their performance for each year with the score 1. The average score of the pure technical efficiency of the commercial banks of Nepal varied from 0.83 (FY 2005) to 0.94 (FY 2007) during the study period.

The pure technical efficiency analysis of the commercial banks with different ownership structure indicates that it was highest for DPB (91.14%), followed by the JVB banks (88.79%) and the PSB (82.06%). It is clear that DPB exhibited a higher mean pure technical efficiency than JVB and PSB. This suggests that DPBs are managerially efficient in controlling expenses compared to JVBs and PSBs.

.   The less efficiency in public sector banks might be the reflective of high government influence, very large branch network and high operating cost and conventional technologies. As per pure technical efficiency, ADBL was running as fully efficient units in every year among PSBs. NABIL bank in year 2005 to 2008; SCBL

bank in 2006 to 2008 and EBL bank in 2006 to 2008 were performing efficiently among joint venture banks. Among DPBs, NIBL bank in year 2006 to 2010, LBL bank in 2007 to 2010 and SBL bank in 2005 to 2008 were functioning efficiently

Table 5-3 Input-oriented pure technical efficiency (variable return to scale)

	Bank's Name	Pure technical efficiency						
		2005	2006	2007	2008	2009	2010	Average
PSB	NBL	0.676	0.722	0.684	0.805	0.731	1.000	0.770
	RBBL	1.000	0.699	0.666	0.624	0.573	0.593	0.692
	ADBL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Average	0.8919	0.892	0.807	0.783	0.810	0.768	0.864
JVB	NABIL	1.000	1.000	1.000	1.000	0.832	0.693	0.921
	SCBL	0.891	1.000	1.000	1.000	0.835	0.970	0.949
	HBL	0.747	0.939	0.859	0.903	0.894	0.766	0.851
	NSBI	0.792	0.881	0.989	1.000	0.683	0.849	0.866
	NBBL	0.584	0.588	0.972	0.878	1.000	1.000	0.837
	EBL	0.839	1.000	1.000	1.000	0.828	0.755	0.921
	Average	0.789	0.790	0.881	0.922	0.941	0.814	0.721
DPB	NIBL	0.852	1.000	1.000	1.000	1.000	1.000	0.877
	BOK	0.768	0.908	1.000	1.000	0.999	0.866	0.895
	NCCBL	0.715	0.850	0.948	0.955	0.922	0.847	0.743
	LBL	0.800	0.862	1.000	1.000	1.000	1.000	0.771
	NIC	0.757	0.796	1.000	0.950	0.957	0.817	0.857
	MPBL	0.944	0.493	0.850	0.913	0.906	0.764	0.756
	KBL	0.874	0.915	0.990	0.977	1.000	0.840	0.919
	LXBL	0.825	0.977	0.981	0.977	0.915	0.800	0.896
	SBL	1.000	1.000	1.000	1.000	0.914	0.795	0.944
	Average	0.837	0.866	0.974	0.974	0.957	0.858	0.911
Average		0.836	0.868	0.940	0.943	0.888	0.853	0.888

As per Table5-3, however the ADBL is a public sector bank, it was the most efficient bank with pure technical efficiency of 100%. The three JVBs (NABIL, SCBL

and EBL) and two DPBs (KBL and SBL) have been found marginal inefficient banks due to the higher efficiency scores in between 90-99.9%. The three JVBs (HBL, NSBI and NBBL) and four DPBs (NIBL, NIC, BOK and LXBL) have performed with the technical efficiency of 80-89.9% while 70-79.9% was the score range for one PSB (NBL), three DPBs (NCCBL, LBL and MPBL). As like the technical efficiency, the pure technical efficiency score of the RBBL (PSB) was also the least (<70%) among all the selected commercial banks.

5.1.3 Scale efficiency of the Nepalese commercial banks

Table 5-4 shows the scale efficiency of individual banks each year. Scale efficiency varied in between 0.90 to 0.97. The average scale efficiency of the commercial banks was 94.50%.

Table 5-4 Input oriented technical efficiency (Constant return to scale)

	Bank's Name	Scale efficiency						
		2005	2006	2007	2008	2009	2010	Average
PSB	NBL	0.834	0.978	0.934	0.989	0.960	1.000	0.949
	RBBL	1.000	0.991	0.998	0.989	0.984	0.992	0.992
	ADBL	0.829	1.000	1.000	1.000	1.000	1.000	0.971
	Average	0.888	0.990	0.978	0.993	0.981	0.997	0.971
JVB	NABIL	1.000	1.000	1.000	0.977	0.987	0.997	0.993
	SCBL	0.998	1.000	1.000	1.000	0.907	0.909	0.969
	HBL	0.886	0.884	0.960	0.989	0.977	0.985	0.947
	NSBI	0.987	0.997	0.976	1.000	0.919	0.605	0.914
	NBBL	0.992	0.978	0.791	0.906	1.000	0.744	0.902
	EBL	0.984	1.000	0.972	0.982	0.974	0.983	0.983
	Average	0.975	0.977	0.950	0.976	0.961	0.870	0.951
DPB	NIBL	0.979	0.965	0.935	0.954	0.821	0.751	0.901
	BOK	0.992	0.985	1.000	1.000	0.910	0.929	0.969
	NCCBL	0.986	0.904	0.702	0.846	0.877	0.833	0.858
	LBL	0.864	0.782	0.725	0.860	0.833	0.844	0.818
	NIC	0.994	0.999	0.950	0.999	0.982	0.930	0.976
	MPBL	0.975	0.655	0.979	0.957	0.948	0.954	0.911
	KBL	0.979	0.999	0.978	0.999	0.994	0.956	0.984
	LXBL	0.996	0.997	0.976	0.998	0.969	0.955	0.982
	SBL	1.000	1.000	1.000	1.000	0.984	0.964	0.991
	Average	0.974	0.921	0.916	0.957	0.924	0.902	0.932
	Average	0.960	0.951	0.938	0.969	0.946	0.907	0.945

This shows that the actual scale of production has differed from the most productive scale size by about 5.50%.According to Hassan and Sanchez [175] if scale inefficiency is greater than pure technical efficiency, it means wrong mix of inputs and outputs for the reasons beyond their control inefficiency. Here, scale inefficiency was 5.50% whereas pure technical inefficiency was 11.16%, suggesting bank executives are using bank resources efficiently and choosing proper mix of inputs and outputs.The similar result was found by Drake and Hall [15] for the Japanese banks and Miller and Noulas [50] for the US banks. When the scale efficiency of the individual bank was examined, ADBL, one of the public sector banks was found operating efficiently with the efficiency score of 1 during the study period. Among JVBs, NABIL from 2005 to 2007 and SCBL from 2006 to 2008 were determined as competent banks while the scale efficiency score of BOK from 2007 to 2008 and of SBL from 2005 to 2008 showed 100% efficient. It was shown in Table 5-4 that all the sampled commercial banks have obtained higher scores for scale technical efficiency (90-99.9%) except two DPBs namely NCCBL and LBL, which ranged in between 80-89.9%.

5.2 Ranks of commercial banks

Different commercial banks had different ranking based on efficiency related to TE, PTE and SE (Table 5-5). Based on the TE, the highest rank was for ADBL, which is a public sector bank, SBL Bank, was the second, which is a domestic private bank and the last position belonged to RBBL, a public sector bank. Based on PTE, the first position was for ADBL while NIBL was occupied the second position which is a domestic private bank and RBBL was in the last position. Based on SE, NABIL was considered to be first position which is a joint venture bank, RBBL was second position and LBL was last position. Based on the reported ranking, it was concluded that the bank with higher technical efficiency does not always mean that it has also higher pure technical efficiency and scale efficiency.

Table 5-5 Ranks of the selected commercial banks in Nepal

	Name of bank	Technical efficiency	Pure technical efficiency	Scale efficiency
	NBL	17	17	11
PSB	RBBL	18	18	2
	ADBL	1	1	8
	NABIL	5	8	1
	SCBL	3	4	10
	HBL	11	14	12
JVB	NSBI	12	13	13
	NBBL	15	15	15
	EBL	8	10	5
	NIBL	9	2	16
	BOK	7	7	9
	NCCBL	16	12	17
	LBL	13	5	18
DPB	NIC	10	11	7
	MPBL	14	16	14
	KBL	4	6	4
	LXBL	6	9	6
	SBL	2	3	3

5.3 Determinants of risk management factors on efficiencies

The results of the Tobit regression analysis are presented in Table 6 and the values of Z-statistics of the coefficients are shown in parentheses. The profitable ratios (ROA and ROE) were positive and significant with regards to TE and PTE but negative and insignificant with respect to SE. It suggests that profitable commercial banks are technically efficient and the commercial banks manager in profitable commercial banks have more incentive to perform effectively. Negative and insignificant relationship between ROE with SE suggested that profitability was not an influencing factor in determining greater scale efficiency during the period of analysis. With regard to the effect of capital adequacy ratio was positive and had significant effect on TE and PTE but negative and statistically insignificant with SE. The results are consistent with Hassan and Sanchez, [175]; Naceur et al. [178]. According to Mester [11], the positively contributed CAR on efficiency implies that if a bank increases its CAR ratio, then its

level of efficiency will increase because higher capital ratios may keep away from ethical risk. Asset quality on efficiency, coefficient for the NPL was negative and insignificant with TE whereas negative but significant with SE. This result suggests that the commercial banks which have higher non-performing loans are less technically efficient. As argued by Berger and Mester (1997) commercial banks that are weak in operation might also be weak in loan management. The result was also consistent with some earlier studies [179-180] From the assets results, suggested that the Nepalese commercial banks can improve their level of technical efficiency by effective evaluation of credit risk. The coefficient on credit to deposits was significantly positive with TE and PTE, suggesting that the Nepalese commercial banks may attempt to utilize the fund it collected; this in turn could increase efficiency level. However, the CDR was determined positive but statistically insignificant with SE.

Table 5-6 Determinants of risk management factors on technical, pure technical and scale efficiencies

Variables	Technical efficiency	Pure technical efficiency	Scale efficiency
Constant	0.922839**(2.274224)	0.780045** (2.192381)	1.055104*(4.000074)
ROA	0.588897**(1.676242)	0.590982***(1.918496)	0.041740 (0.182773)
ROE	0.060499**(2.461532)	0.061838*(2.869484)	-0.000181 (-0.011349)
CAR	0.307717***(1.906066)	0.334950**(2.366223)	-0.054151(-0.516007)
NPL	-0.193982(-1.122523)	0.130012 (0.858041)	-0.362861*(-3.230277)
CDR	0.190374**(2.311159)	0.192389*(2.663731)	0.025552(0.477215)
SIZE	-0.021525(-0.448241)	-0.007674 (-0.182251)	-0.072117 (-0.177290)
OWN	-0.111123**(-2.070225)	-0.035038(-0.744457)	-0.005534**(-2.066894)

OWN-Ownership; *indicates significant at 1% level of significance, **indicates significance at 5% level of significance, ***indicates significant at 10% level of significance

Regarding the ownership dummy had a negatively significant with in every case efficiency versus private (both domestic and joint venture) ownership. This means public sector bank was also significant contributor in the efficiency of the commercial banks. The relationship between commercial bank size and efficiency in this study was found negative and insignificant. This result is inconsistent with the finding of Pasiouras *et al.*, [154] for Greek cooperative banks. This empirical results suggests that as bank size

increases, the level of efficiency decreases. There might be number of possible reasons for this inverse relationship between efficiency and size of banks in case of Nepal. The small banks tend to surpass large banks due to limited market segments with better information access and less agency hitch. Moreover, the lower originating, servicing and monitoring costs per currency of loan for the small banks compared to larger banks assists in achieving higher level of efficiency [55].

5.4 Determinants efficiency under profit oriented approach

5.4.1 Efficiency estimates-individual commercial banks

Table 5-7 shows the technical efficiency scores under CRS of individual banks. Among the public sector banks, Nepal Bank Limited was fully efficient in year 2007, 2009 and 2010 while Rastriya Banijya Bank Ltd and Agricultural Development Bank Ltd were only fully efficient in year 2009 and 2010 because the share of non-performing loan is very high from 2005 to 2008. Poor evaluation, insufficient follow up and supervision of loan distribution ultimately resulted in massive booking of poor quality assets, the level of which remains high. Hence, more provisions had to be made. In 2009 and 2010, this situation slightly improved and the growth in NPL was reduced. Among the joint venture banks, NABIL Bank Ltd bank was fully efficient from 2005 to 2009 and Standard Chartered Bank Ltd showed the consistency at its efficiency scores for all the years. Both NABIL and SCBL, which are holding highest share of deposits, have shown relatively better performance than rest while Nepal Bangladesh Bank Ltd from 2008 to 2009 and Everest Bank Ltd in 2010 showed fully efficient. No any domestic private banks had 100% efficiency from 2005 to 2010. Nepal Credit and Commerce Bank Ltd from 2008 to 2010, Lumbini Bank Ltd (LBL) in 2009, Nepal Industrial and Commercial Bank Ltd (NICBL) in 2008 and Laxmi Bank Limited from 2009 to 2010 were fully efficient. DPB have also shown a good efficiency trend. This shows that less slack was produced by these banks.

Thus, the fully efficient banks armed with modern banking technology and business performance. It is remarkable here that the method of resource use in the efficient banks is functioning well, and featuring no misuse of resources. In the strength of DEA

terminology, these commercial banks can be termed as internationally efficient banks. Other banks were deviating a lot from the optimal input-output mix. It shows that some large banks were efficient. Hence, it is using economies of scale to take advantage and able to maximize profits. However, a few other large banks are unable to achieve technical efficiency in the same way as their counterparts have taken. This is due to internal factors relating to non-interest income and to external factors like loan loss provisions.

Table 5-7 Individual commercial banks technical efficiency under CRS

Technical efficiency

	Bank' Name	2005	2006	2007	2008	2009	2010	Average
PSB	NBL	0.487	0.780	1.000	0.981	1.000	1.000	0.875
	RBBL	0.410	0.689	0.811	0.843	1.000	1.000	0.792
	ADBL	0.698	0.620	0.743	0.882	1.000	1.000	0.824
	Avg	0.532	0.696	0.851	0.902	1.000	1.000	0.830
JVB	NABIL	1.000	1.000	1.000	1.000	1.000	0.978	0.996
	SCBL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	HBL	0.464	0.536	0.492	0.689	0.693	0.759	0.606
	NSBI	0.369	0.382	0.421	0.489	0.462	0.690	0.469
	NBBL	0.233	0.406	0.901	1.000	1.000	0.792	0.722
	EBL	0.456	0.622	0.788	0.993	0.770	1.000	0.771
	Avg	0.587	0.658	0.767	0.862	0.821	0.870	0.761
DPB	NIBL	0.716	0.595	0.617	0.634	0.563	0.996	0.687
	BOK	0.476	0.622	0.577	0.656	0.743	0.927	0.667
	NCCBL	0.213	0.290	0.397	1.000	1.000	1.000	0.650
	LBL	0.291	0.291	0.783	0.624	1.000	0.891	0.647
	NIC	0.457	0.357	0.471	1.000	0.618	0.869	0.629
	MPBL	0.998	1.000	0.867	0.572	0.527	0.442	0.734
	KBL	0.620	0.600	0.571	0.486	0.493	0.740	0.585
	LXBL	0.546	0.634	0.725	0.605	1.000	1.000	0.752
	SBL	0.587	0.665	0.763	0.709	0.692	0.678	0.682
	Average	0.545	0.562	0.641	0.699	0.737	0.838	0.670
	Average	0.557	0.616	0.718	0.787	0.809	0.876	0.727

Table 5-8 shows the pure technical efficiency scores under VRS of individual banks. RBBL and ADBL were found operating efficiently with the efficiency score of 1. Similarly, NABIL and SCBL were fully efficient from 2005 to 2010 while NBL from 2006 to 2010, NBBL from 2008 to 2010 and EBL in 2010 showed 100% efficient among JVBs. Among DPBs, LXBL was fully efficient while Siddhartha Bank Ltd from 2005 to 2008, Nepal Investment Bank Ltd from 2009 and 2010, Nepal Credit and Commerce Bank Ltd (NCCBL) from 2008 to 2010, LBL from 2007 to 2010, NIC in 2008, Machhapuchhre Bank Ltd from 2005 to 2008 showed fully efficient.

Table 5-8 Individual selected commercial banks pure technical efficiency under VRS

	Bank	Pure Technical efficiency						
		2005	2006	2007	2008	2009	2010	Avg
PSB	NBL	0.912	1.000	1.000	1.000	1.000	1.000	0.985
	RBBL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	ADBL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Avg	0.971	1.000	1.000	1.000	1.000	1.000	0.995
JVB	NABIL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	SCBL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	HBL	0.521	0.570	0.522	0.690	1.000	0.786	0.681
	NSBI	0.530	0.594	0.738	0.798	0.545	0.723	0.655
	NBBL	0.309	0.505	0.985	1.000	1.000	1.000	0.800
	EBL	0.544	0.677	0.876	0.938	0.870	1.000	0.817
	Avg	0.651	0.724	0.854	0.904	0.903	0.918	0.826
DPB	NIBL	0.716	0.604	0.636	0.886	1.000	1.000	0.807
	BOK	0.627	0.675	0.953	0.999	0.833	0.944	0.838
	NCCBL	0.379	0.589	0.953	1.000	1.000	1.000	0.820
	LBL	0.568	0.775	1.000	1.000	1.000	1.000	0.891
	NIC	0.566	0.538	0.701	1.000	0.840	0.952	0.766
	MPBL	1.000	1.000	0.981	0.966	0.624	0.476	0.841
	KBL	0.684	0.692	0.867	0.840	0.859	0.922	0.811
	LXBL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	SBL	1.000	1.000	1.000	1.000	0.880	0.779	0.943
	Average	0.727	0.764	0.899	0.966	0.893	0.897	0.858
	Average	0.742	0.790	0.901	0.951	0.914	0.921	0.870

As per Table 5-9, when the scale efficiency of the individual bank was examined, all the PBS was fully efficient in 2009 and 2010. Among JVB, NABIL from 2005 to 2009 and SCBL from 2005 to 2010 were determined as competent banks while the scale efficiency score of NBBL from 2008 to 2009 and EBL 2010 showed 100% efficient. NCCBL from 2008 to 2010, NIC in 2008, MPBL in 2006, LXBL from 2009 to 2010 showed 100% efficient among DPB.

Table 5-9 Individual commercial banks scale efficiency

Bank		Scale efficiency						Avg
		2005	2006	2007	2008	2009	2010	
PSB	NBL	0.534	0.780	1.000	0.981	1.000	1.000	0.883
	RBBL	0.410	0.689	0.811	0.843	1.000	1.000	0.792
	ADBL	0.698	0.620	0.743	0.882	1.000	1.000	0.824
	Avg	0.547	0.696	0.851	0.902	1.000	1.000	0.833
JVB	NABIL	1.000	1.000	1.000	1.000	1.000	0.978	0.996
	SCBL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	HBL	0.891	0.941	0.941	0.998	0.693	0.965	0.905
	NSBI	0.695	0.643	0.570	0.613	0.848	0.955	0.721
	NBBL	0.752	0.803	0.915	1.000	1.000	0.792	0.877
	EBL	0.838	0.919	0.900	1.059	0.885	1.000	0.933
	Avg	0.863	0.884	0.888	0.945	0.904	0.948	0.905
DPB	NIBL	0.999	0.987	0.970	0.716	0.563	0.996	0.872
	BOK	0.760	0.921	0.605	0.657	0.892	0.982	0.803
	NCCBL	0.563	0.493	0.417	1.000	1.000	1.000	0.746
	LBL	0.513	0.375	0.783	0.624	1.000	0.891	0.698
	NIC	0.807	0.663	0.672	1.000	0.736	0.913	0.798
	MPBL	0.998	1.000	0.884	0.593	0.844	0.929	0.875
	KBL	0.907	0.868	0.658	0.579	0.574	0.803	0.731
	LXBL	0.546	0.634	0.725	0.605	1.000	1.000	0.752
	SBL	0.586	0.664	0.763	0.708	0.786	0.870	0.730
	Avg	0.742	0.734	0.720	0.720	0.822	0.932	0.778
	Avg	0.750	0.778	0.798	0.826	0.879	0.949	0.830

5.4.2 Efficiency score-ownership classification

Table 5-10 demonstrates average efficiency under profit oriented approach classified on the basis of ownership. There was an increasing trend in their mean of yearly efficiency measures of the commercial banks of Nepal. The average annual score based on CRS for PSB, JVB and DPB from 2005 to 2010 were determined 83%, 76% and 67% respectively. It indicated that PSB exhibited higher average efficiency compared to their counterparts. This result is contrary to Arief and Can [181] which

showed that the JVB are profit-efficient relative to the PSB for Chinese banks. One major cause for this is the Nepalese banking system is dominated by PSB in terms of deposit mobilization and PSB hold larger share of total deposit of the banking system, thereby resulting in higher profits. It is often argued that larger banks possess more flexibility in financial markets and are better able to expand their credit risks [182]. Due to having relatively very few branch networks with limited assets, JVB and DPB have little capacity to deposit mobilization in small urban or rural savings and make lower profit than PSB.

The level of managerial efficiency as revealed by PTE score under VRS is more in PBS relative to JVB and DPB. In VRS specification, the average score of the efficiency of the commercial banks of Nepal varied from 0.65 to 1. PSB showed the consistency in their performance for each year with the score 1 whereas DPB had higher profit efficiency under VRS (86%) than that for JVB (82%). The pure technical inefficiency is generally caused by inappropriate management practices but in case of Nepal, higher meant profit efficiency under VRS for PSB was consistent with the PSB have a large volume of operations and resources in Nepal. They would be able to get in benefits of economies of scale and earn more profit. On the other hand, JVB and DPB have relatively lower profit due to higher costs in their small branch networks. As stated before, scale efficiency score for each bank can be obtained by taking a ratio of technical efficiency score to pure technical efficiency score. The value of scale efficiency equal to 1 means that the bank is working at most dynamic scale size which corresponds to constant returns-to-scale. Furthermore, being scale efficiency less than 1 shows that the bank is not operating at its optimal scale. The scale efficiency of the commercial banks showed the mean efficiency each year by decomposing profit efficiency under CRS into profit efficiency under VRS and scale efficiency to gain insight into the main sources of inefficiencies. The scale efficiency varied in between 0.55 to 1. The average scale efficiency of the commercial banks was 84%, indicating that the actual scale of production has differed from the most productive scale size by about 16%. According to Hassan and Sanchez [175] if scale inefficiency is greater than profit efficiency under VRS, it means wrong mix of inputs and outputs for the reasons

beyond their control inefficiency. Here, scale inefficiency was 16% whereas profit inefficiency under VRS was 11%, suggesting wrong mix of inputs and outputs.

Table 5-10 Average efficiency of commercial banks

Year	Technical efficiency				Pure technical efficiency				Scale efficiency			
	PSB	JVB	DPB	Avg	PSB	JVB	DPB	Avg	PSB	JVB	DPB	Avg
2005	0.53	0.59	0.54	0.55	0.97	0.65	0.73	0.78	0.55	0.86	0.74	0.72
2006	0.70	0.66	0.56	0.64	1.00	0.72	0.76	0.83	0.70	0.88	0.73	0.77
2007	0.85	0.77	0.64	0.75	1.00	0.85	0.90	0.92	0.85	0.89	0.72	0.82
2008	0.90	0.86	0.70	0.82	1.00	0.90	0.97	0.96	0.90	0.95	0.72	0.86
2009	1.00	0.82	0.74	0.85	1.00	0.90	0.89	0.93	1.00	0.90	0.82	0.91
2010	1.00	0.87	0.84	0.90	1.00	0.92	0.90	0.94	1.00	0.95	0.93	0.96
Avg	0.83	0.76	0.67	0.75	1.00	0.82	0.86	0.89	0.83	0.91	0.78	0.84

5.5 Comparison of efficiency under intermediation and profit approach

5.5.1 Efficiency comparison of the individual banks

The average technical efficiency scores and the profit efficiency scores of the individual banks included in the sample are presented in Table 11. It was shown that no any Nepalese commercial banks obtained 100% technical efficiency under intermediation approach but ADBL, NABIL, SCBL, KBL, and SBL have been categorized as marginal inefficient banks because they have attained TE score above the 90% but less than 100%. Under profit efficiency approach, only SCBL obtained fully efficient while NABIL was also near to 100% during the study period. This result indicated that SCBL and NIBL have done well for technical efficiency under intermediation approach, as they were able to perform their essential role and manage their profitability. Although some banks were functioning at a high level of operating efficiency and marginally inefficient under intermediation approach, these banks were

maximum inefficient under profit-oriented approach. This result clearly shows that it is not necessary that a technically efficient bank is also optimally profitable.

Table 5-11 Comparison of efficiency under intermediation and profit- oriented approach

	Bank	Under intermediation approach			Under profit-oriented approach		
		TE	PTE	SE	TE	PTE	SE
Public Sector Banks	NBL	0.734	0.770	0.949	0.875	0.985	0.883
	RBBL	0.688	0.692	0.992	0.792	1.000	0.792
	ADBL	0.971	1.000	0.971	0.824	1.000	0.824
	Average	0.798	0.864	0.971	0.830	0.995	0.833
Joint Venture Banks	NABIL	0.915	0.921	0.993	0.996	1.000	0.996
	SCBL	0.921	0.949	0.969	1.000	1.000	1.000
	HBL	0.806	0.851	0.947	0.606	0.682	0.905
	NSBI	0.794	0.866	0.914	0.469	0.655	0.721
	NBBL	0.744	0.837	0.902	0.722	0.800	0.877
	EBL	0.888	0.921	0.983	0.771	0.817	0.933
	Average	0.845	0.721	0.951	0.761	0.826	0.905
Domestic Private Banks	NIBL	0.877	0.877	0.901	0.687	0.807	0.872
	BOK	0.895	0.895	0.969	0.667	0.838	0.803
	NCCBL	0.743	0.743	0.858	0.650	0.820	0.746
	LBL	0.771	0.771	0.818	0.647	0.891	0.698
	NIC	0.857	0.857	0.976	0.629	0.766	0.798
	MPBL	0.756	0.756	0.911	0.734	0.841	0.875
	KBL	0.919	0.919	0.984	0.585	0.811	0.731
	LXBL	0.897	0.896	0.982	0.752	1.000	0.752
	SBL	0.944	0.944	0.991	0.682	0.943	0.730
	Average	0.851	0.911	0.932	0.670	0.858	0.778

PTE showed that the ADBL was the most efficient bank with PTE efficiency of 100%. NABIL, SCBL, EBL, KBL and SBL have been found marginal inefficient banks due to the higher efficiency scores in between 90-99.9% under intermediation approach while under profit-oriented approach RBBL, ADBL, NABIL, SCBL and LXBL were fully efficient whereas NBL and SBL were close to 100%. It shows that under profit-oriented approach more banks were efficient than that of under intermediation approach. The results contradict the results of Drake et al. [183] who stated that technical efficiency is generally higher under the intermediation approach than under the profit-oriented approach. The results support the results of Pasiouras.F. [154] for Greek commercial banks. Under intermediation approach, SE ranged between 81.8 to 99.2% while under profit -oriented approach most of the banks were ranged below 90%; only SCBL was fully efficiency. It indicated that commercial banks are performing better as the intermediary function while it did not happen the same in managing the profitability.

5.5.2 Comparison efficiency of ownership structure

Fig. 5-1 compares the results of technical efficiency under intermediation approach and profit oriented approach for PSB, JVB and DPB. The average TE under intermediation approach of PSB ranged between 0.755 (2009) and 0.863 (2010).
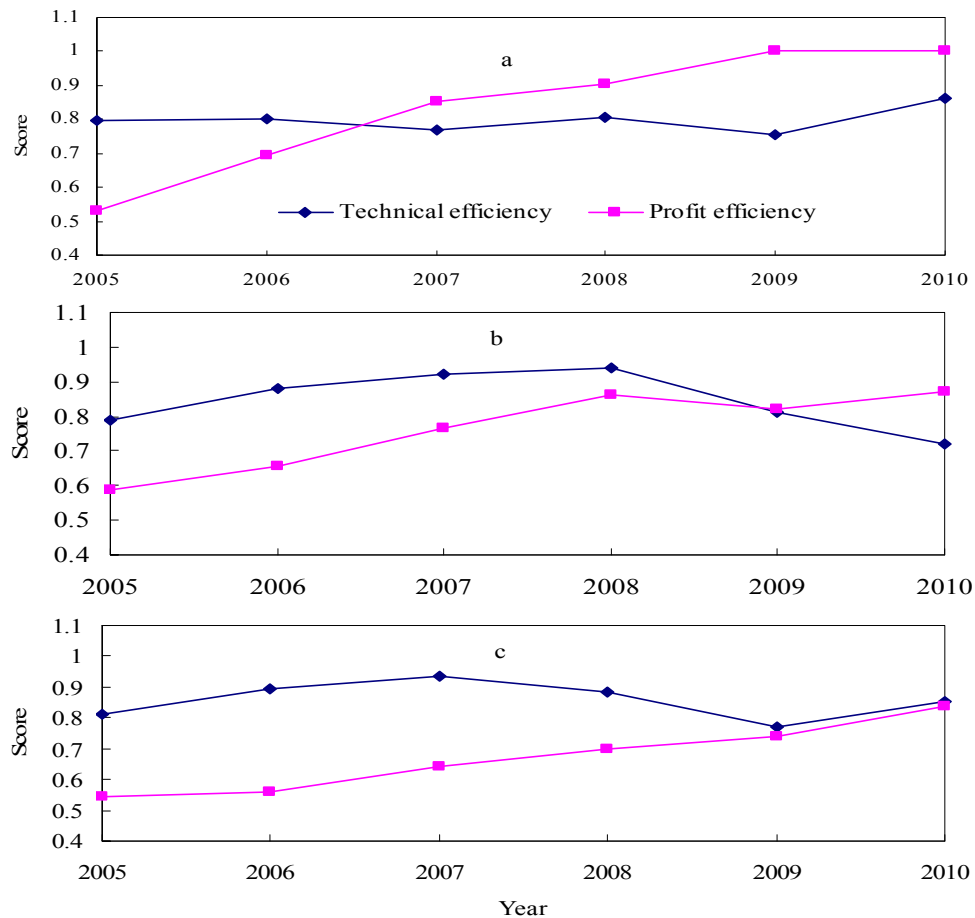

Fig. 5-1 Technical efficiency and profit efficiency under ownership structure

Hence, it indicated that there was a fluctuating trend in their mean of yearly technical efficiency measured of the commercial banks of Nepal over the study period. It causes the public sector banks are not performing very well in technical efficiency especially in the six years while the profit efficiency improved significantly 0.532 (2005) and 1.00 (2009, 2010).The results support the results of Drake et al. [183] who stated that technical efficiency is generally higher under the intermediation approach than under the profit approach. The mean efficiency level under intermediation approach and profit

oriented approach of domestic private sector bank was ranged between 0.770 (2009), 0.933 (2007) and when included off-balance sheet items as an output and loan loss provision as an input. Thus, scheming for credit risk appeared to have impact on the efficiency scores. It can be stated that public sector banks are managing the profitability but still struggling in stabilizing the efficiency in relation with technical efficiency. This evaluation contradicts the results of Drake et al. [183] who stated that technical efficiency is generally higher under the intermediation approach than under the profit-oriented approach.

The comparison of technical efficiency under intermediation approach and profit oriented approach of the joint venture banks revealed that they were relatively technical efficient. The average value of technical efficiency was in increasing trend except 2010 ranged between 0.721(2010) and 0.941 (2008) while profit oriented approach was also in increasing trend ranged between 0.586 (2005) and 0.869 (2010). This result ensures JVB performed outstandingly in terms of intermediary efficiency and also manage their profitability. 0.545 (2005), 0.838 (2010). Under intermediation approach, technical efficiency was in fluctuating trend whereas technical efficiency was in increasing trend under profit-oriented approach. Although technical efficiency under intermediation approach was in fluctuating trend but efficiency was in international standard like other developing countries. This result clearly explains that domestic private sector commercial banks in Nepal have done well for technical efficiency under intermediation approach as they are able to perform their essential roles and manage their profitability. The intermediation approach and profit-oriented approach technical efficiency of domestic private banks was well over the examined period. DPB had the advantage of being created in the early 2000 and so were better placed to adopt high-level technology when established.

5.6 Chapter summary

The competitive scenery of the global economic activity needs the productivity-driven banking industry to be paying special attention for its relative level

of efficacy compared to its competitors. The technical efficiency, pure technical efficiency and scale efficiency of the selected eighteen commercial banks in Nepal using input-oriented data envelopment analysis for the period 2005 to 2010. Under the intermediation approach, the mean technical inefficiency of the commercial banks was 16.0% while the average pure technical and scale inefficiencies were 11.16% and 5.50%, respectively. The pure technical inefficiency of Nepalese commercial banks was higher than the scale inefficiency .This implies that pure technical inefficiency might be the main reason behind technical inefficiency in the Nepalese banking sector. The Tobit model to estimate the impact of risk management factors indicates that the capital risk , Liquidity risk , profitable ratios (ROA and ROE) have influenced the efficiencies, however credit risk reduced the levels of the commercial banks efficiency. Commercial bank size had consistently inverse impact on technical, pure technical and scale efficiencies. Furthermore, the joint venture and domestic private banks were more efficient than public sector banks, which suffered managerial underperformance.

Under profit-oriented approach concerning the ownership, the public sector banks were more efficient than joint venture banks and domestic private banks during the study period of 2005-2010 because public sector banks have higher the size of total assets. The commercial banks that have expanded their operations in large scale appeared to be more profit efficient than those operating only at a small scale. Not only this, increasing loan activity of the public sectors banks made them more efficient than joint venture banks and domestic private banks, which have limited networking and urban concentration. The individual commercial banks yearly analysis showed that the efficiency of majority of the banks in Nepal is still not fully efficient. Thus, it is still needed for commercial banks in Nepal to improve their efficiency.

By using two approaches of intermediation and profit oriented under DEA model, year by year, results indicated that the individual commercial banks of Nepal have performed well for the intermediary role in terms of overall mean. Profit oriented approach revealed that banks are still struggling in stabilizing the efficiency in relation with profit seeking activities. Comparing scores obtained from the intermediation approach with those obtained from the profit-oriented approach of different ownership structured banks provided mixed results. However, we find that in terms of the overall

mean, the public sector banks profit-oriented approach efficiency provided higher efficiency scores than intermediation approach efficiency whereas joint venture banks and domestic private banks provided intermediation approach score higher than profit-oriented approach efficiency. Although, public sector bank's overall mean was more than their counterparts under profit-oriented approach but individually joint venture banks namely NABIL and SCBL were fully efficient. It indicated that the public sector banks are not mobilized savers money for profit making entrepreneurs.

Chapter 6 Linkage of financial indicators and economic growth

The relationship between financial variables and economic growth remains a controversial issue. In this context, it is crucial to know whether commercial banks financial indicators contribute to economic growth in Nepal. The aim of this part of the study was to empirically examine the links between deposit, credit (loan and advance) and assets with economic growth in the term of GDP using an ordinary least square, unit root test and granger causality test. It was also imperative to explore the relationship of return on assets, return on equity, non-performing loan, capital adequacy ratio, credit to deposit ratio, technical efficiency under intermediation approach and technical efficiency under profit-oriented approach with economic growth.

6.1 Effect of financial variables on economic development

6.1.1 Descriptive statistics of RGDP and commercial banking variables

An introspection of the Table 6-1 reveals that the real GDP per capita has been increased from 1975 to 2010. A growth over the period of study indicates an improvement in the financial sector. The acceleration of the Real GDP per capita growth rate is basically due to a significant attributed to the country's macroeconomic policy initiatives as well as political environment. The growing inflow of money remitted by Nepalese people working abroad, especially in the Middle East and gulf countries has played significant role to maintain the RGDP per Capita. The overall mean value of the RGDP was 8.079 with the standard deviation of 0.212. Regarding the banking performance variables, deposit was in increasing trend. This is due to structural

changes of Nepalese economy and due to the effort of financial sector reform program implemented by the government. Increment in RGDP led to an increase of money supply in economy that helped the banking sector to have more deposits. High deposits lead to more lending and that results in more investments and hence leads to fast economic growth. The overall mean value of the deposit was 10.38 with standard deviation of 1.87. Growing loan and advances indicated that the role of loan was expanding fast as a source of funding for economic activities in the country. The mean value of the loan and advances was 10.11 with the standard deviation of 1.90. Similarly, increasing commercial banks assets confirms that the process of economic liberalization and financial sector liberalization over last decades in economy brought structural changes in the industry. This was based on the belief that with increased size of the commercial banks would become stronger, resilient to shocks and capable of funding the real sector and, by extension, enhancing economic growth [184]. The mean value of the assets was 10.69 with standard deviation of 1.88. The process of deregulation and reform led to rapid expansion of number of banks, deposit and loan and their assets.

Table 6-1 Descriptive statistic of the variables

Variable	N	Minimum	Maximum	Mean	Std. deviation
RGDP	36	6.95	7.60	7.26	0.23
Deposit	36	7.07	13.33	10.40	1.86
Loan and Advance	36	7.08	13.13	10.11	1.90
Asset	36	7.51	13.58	10.69	1.88

6.1.2 Examine the stationary of proxy measures

The results of the Augmented Dickey Fuller test are reported in Table 6-2. The Schwartz Bayesian Criterion was used to determine the optimal number of lags included in the test. The Augmented Dickey Fuller test results suggest that at the 1% significance level could not reject the null hypothesis for any variables, which meant that the unit root problem existed and the series were non-stationary. Almost all the variables including deposit, loan and advances and assets have non-stationary both when include intercept and when include intercept and trend at level while all the variables were stationary at first difference except assets. This result gives support to the use of

ordinary least square to determine the relationships of banking financial variables and economic growth.

Table 6-2 Augmented Dickey Fuller test for level and 1st difference variables

Level			1st difference		
Variable	Intercept	Trend & Intercept	Variable	Intercept	Trend & Intercept
RGDP	-0.292 (0.916)	-1.917 (0.624)	RGDP	-6.124(0.0000)	-5.957(0.0001)*
Deposit	-2.193(0.212)	-1.645(0.753)	Deposit	-4.195(0.0024)	-4.31 (0.0087)*
Loan	-0.086 (0.943)	-1.92 (0.620)	Loan	-4.947(0.0003)	-4.88 (0.0021)*
Assets	-1.376 (0.582)	-0.80 (0.955)	Assets	-2.470(0.1315)	-2.57 (0.2946)

* Indicate that the variable is significant at 1% respectively.

6.1.3 Determinants of financial variable and RGDP

The Unit Root test resulted in the time series data were non-stationary in this study. Thus, the relationship between Nepalese commercial banking performances with the economic growth was analyzed using the regression analysis and the model was estimated by ordinary least square. The estimated results are provided in Table 6-3. The value of R-Square, the coefficient of determination, represented the correlation between the observed values with the predicted values of the dependent variable and provided the adequacy of the model. Here the value of the R-Square was 0.963 that meant the independent variable in the model could predict 96.3% of the variance in the dependent variable. The p-value was given by 0.000, which was less than 0.05, which showed the significance of the model. The regression models assume that the error deviations are uncorrelated.

The Beta value showed the relationship between the variables in the model, if the value of the coefficient was positive. It meant that the independent variables have positive relation with the dependent variable i.e. increase in the dependent variable was caused by raise in the independent variable. And if the value of the coefficient was negative, then the independent variables were having negative relation with the dependent variable i.e. decrease in dependent variable was caused by increase in dependent variable [185]. The values of the coefficients beta and constant were used to construct the regression model. That is: Beta coefficient showed the tendency of an independent variable to respond against dependent variables. Therefore greater value of

the beta indicated the larger impact on the dependent variable and vice versa. From the regression analysis, it can be observed that the constant parameter was 6.908 that were if all exogenous variables were held constant, economic growth was enhanced by 6.908 units.

The deposit and economic growth were negatively but significantly related with the economic growth. Deposit coefficient with a value of -0.268 implied that if deposit was increased by a unit, economic growth was threatened as it made RGDP to decline by 0.268. The result is in agreement with the previous research findings Ekpenyong and Acha, [186], in which the contribution of the banks in Nigeria in the terms of savings mobilization and credit to the real sector was attributed with the growth of the economy of the country. Deposit is expected to positively impact on economic growth as suggested by [1] but this finding deviates from their hypothesis. This can be attributed to the fact that commercial banking in Nepal has not strategically positioned banks to adequately mobilize enough deposit that would positively impact on the economy. Apart from that, one major cause for this is the Nepalese banking system is dominated by the public sector banks in terms of deposit mobilization and the public banks hold larger share of total deposit of the banking system. Joint venture and domestic private banks have very few branch networks and are concentrated in urban centers. This showed little capacity to absorb small urban or rural savings and serve the credit needs of the small borrowers, rural or urban. Hills and mountains have had few financial facilities for small deposit mobilization. In Terai areas bordering India, deposit also flowed to the banks across the border, although Nepal offered higher nominal and positive interest rates [163]. The commercial banks limited their operations to large amounts- both in acceptance of deposits and lending. As far as commercial banks are concerned, this problem has been aggravated by liberalization of the banking sector. The minimum balance requirements in some Kathmandu Valley banks make them unapproachable even to the middle class families in the Valley. Bulk investor also has ability to negotiate on interest rates, which small investor lack. More evidences are available that average households in rural areas can save smaller amounts. But the commercial banks have shown little interest in this kind of savings. Given the oligopolistic cartel ling, they are over liquid and have no need to innovate for deposit

mobilization. The formal financial system continues to have an urban bias. Its liberalization has helped to intensify this bias. Most of Commercial banks are concentrated in the Kathmandu valley or sub-urban areas because majority of modern sector activities take place in the urban areas and resources are concentrated there [163]. Lack of infrastructure has further impeded financial sector activities in rural areas. The negative but significant result also indicates that the commercial banks deposit in a country is crucial to the economic development.

A positive but insignificant relationship is established between loan and advances and economic growth. This result is inconsistent with the finding of Aurangzeb, [185] for the Pakistan banking sector. The loan and advances coefficient was 0.120, implying that a unit increase in loan and advances leads to an increase in RGDP by 0.120 units. The implication of this is that commercial banks were unable to find an appropriate client for ending their excess liquidity in the market and the funds directed to them by banks have not been optimally utilized to increase their productivity which inevitably improves economic growth. Besides, this might be due to the commercial banks are concentrated in urban areas. The excess of credit programs has made very little dent in the rural credit market. More than 80 percent of the borrowing households have still to depend on non-formal sources for their credit needs. Majority of the credit programs have been unable to directly cater to the needs of the bottom 20 percent households because the poor lack other resources and knowledge to benefit from the deposit-credit programs. Also, the negligence of commercial banks in the credit administration process increases the chances for non-performing loans and other classified assets and this has adverse effect on bank capital and the economy at large. This effect reduces the ability of commercial banks to further extend credit and may cause bank distress or failure since the profitability of a bank is directly related to the credit it grants. The lending rate charged on credit by banks is on the high side which deters investors from borrowing to embark on productive activities and give room for moral hazard. This runs contrary to the findings of Aurangzeb [185] for the Pakistan banking sector. Although the relationship of loan and advances and RGDP found weak they did not mean that loan did not matter for the economy. Much to the contrary, they reinforce the argument that credit has a crucial role on overall productivity via a correct allocation of financial

resources, a conclusion that has already found convincing empirical backing (Bebczuk and Garegnani [187]. The assets of the commercial banks plays significant and equal role in economic growth as signified by the positive and statistically significant coefficient, which meant that the assets of the Nepalese commercial banks relative to domestic economy did add value to its economy. Therefore, commercial banking sector is necessary to represent an added value for local economy.

Table 6-3 Regressions between commercial banking performance and real GDP

Variable	Coefficient	t-statistic	Probability
C	6.908	90.427	0.000
Deposit	-0.268**	-2.248	0.0316
Loan	0.120	1.617	0.1157
Assets	0.256***	1.763	0.0874
R-Squared	0.96		
F-Statistic (Probability)	282.52 (0.000000)		

, * Indicate that the variable is significant at 5% and 10% respectively.

This result contradicts the finding of Ali [171] which shows that the assets are insignificant with economic growth for the Lebanon banking sector. The asset coefficient was 0.256, implying that a unit increase in asset leads to an increase in RGDP by 0.256 units respectively. According to the Ordinary Least Square model, the result showed that, deposit, and assets were significant effect on the economic growth. For that reason, hypotheses 1 and 3 have been accepted and have a significant impact on economic growth of Nepal while loan and advances was not significant with economic growth. For that reason hypothesis 2 has been rejected.

6.1.4 Causal relationship of financial variables and economic growth

Table 6-4 shows that Granger Causality test between the commercial banking performance in terms of deposit, loan and advance and asset and economic growth in Nepal. The F-statistics and its corresponding values of the probability suggest that none of the commercial banking performance measures seemed to granger cause the economic growth in Nepal. This suggests that neither the deposit, nor loan and advances, nor commercial banks assets granger caused the economic growth in Nepal. Therefore, this study was accepting the null hypothesis. On the other hand, the results of Granger Causality models reveal that growth in the economic activities in Nepal (represented by

RGDP) did not seem to granger cause the deposit, loan and advances and assets. It might be either the size of market is too small.

Table 6-4 Granger causality test- commercial banking performance and economic growth in Nepal

Null Hypothesis:	F-Statistic	Probability
Deposit does not granger cause GDP	2.36771	0.1116
GDP does not granger cause deposit	0.46194	0.6346
Loan does not granger cause GDP	1.59730	0.2197
GDP does not granger cause loan	0.15989	0.8530
Assets does not granger cause GDP	2.23719	0.1249
GDP does not granger cause assets	0.39836	0.6750

Most of the banks are highly concentrated in urban areas, particularly in Kathmandu valley and even more, particularly in city centers and commercial banks might not be efficiently transforming deposit into loan and that most of the loan they grant might not be for productive purposes.

6.2 Relation of risk factors, efficiency and economic growth

This topic has looked at the relationship between the risk, efficiency and economic growth of commercial banks of Nepal. This topic included several variables bank specific factor and technical efficiency under intermediation approach and profit oriented approach.

6.2.1 Examine the stationary of proxy measures

Table 6-5 demonstrates the finding of the Augmented Dickey Fuller test. The ADF test results suggest that at the 1% and 5% significance level could not reject the null hypothesis for any variables, which meant that the unit root problem existed and the series were non-stationary. Almost all the variables including RGDP, CAR, CDR, IEFFI, NPL, ROA, ROE and PEFFI have non-stationary both when include intercept

and when include intercept and trend at level and first difference. All the variables were checked at the lag length of Zero at level and lag length of one at first difference.

Table 6-5 Augmented Dickey Fuller tests for level and 1st difference variables

Level			1st difference		
Variable	Intercept	Trend & Intercept	Variable	Intercept	Trend & Intercept
RGDP	-10.242 (0.000)	-10.190 (0.000)	RGDP	-10.330 (0.000)	-10.279(0.000)
CAR	-2.856(0.054)	-2.899(0.004)	CAR	-8.301 (0.000)	-8.336 (0.000)
CDR	-3.636 (0.006)	-4.124(0.007)	CDR	-11.857 (0.000)	-11.828(0.000)
NPL	-5.150(0.000)	-5.256(0.000)	NPL	-10.186(0.000)	-10.110(0.000)
ROA	-7.068 (0.000)	-7.0877(0.000)	ROA	-13.137 (0.000)	-13.072(0.000)
ROE	-11.484 (0.000)	-11.484 (0.000)	ROE	-14.844 (0.000)	-14.777 (0.000)
IEFFI	-6.148 (0.000)	-6.121 (0.000)	IEFFI	-12.363 (0.000)	-12.318 (0.000)
PEFFI	-6.125 (0.000)	-6.485 (0.000)	PEFFI	-12.270 (0.000)	-12.209(0.000)

IEFFI-Technical efficiency under Intermediation approach.
PEFFI-Technical efficiency under Profit oriented approach.

6.2.2 Commercial banking risk and efficiency with economic growth

Table 6-6 shows that Granger Causality test between the commercial banking risk, efficiency and economic growth in terms of capital adequacy, credit to deposit ratio, non-performing loan, return on assets, return on equity, technical efficiency under intermediation approach, technical efficiency under profit-oriented approach and real GDP growth. The null hypothesis that ROA does not Granger cause economic growth was rejected; however, the inverse null was accepted, implying that the causality goes from return on assets to economic growth. The result has indicated that the increase in return on assets has a positive impact on the RGDP. Moreover, the result has also shown that ROA is a significant driver of commercial Banks. The result is in agreement with the findings of Karkrah and Ameyaw [188]. However, the result is contradict the findings of earlier work done by Husni [189] which observed that there was a significant and negative relationship between ROA and Annual Growth Rate for Gross domestic product (RGDP) of the commercial banks in Jordan. Ali et al [171] noted that the GDP and ROA were positively related to each other for the Pakistani commercial banks.

Table-6-6 Granger causality test between risk management, efficiency and economic growth

Null Hypothesis	Observations	F-Statistic	Probability
ROA does not Granger Cause RGDP	106	2.53168	0.0846
RGDP does not Granger Cause ROA		1.11987	0.3303
ROE does not Granger Cause RGDP	106	0.14442	0.8657
RGDP does not Granger Cause ROE		3.41266	0.0368
CAR does not Granger Cause RGDP	106	1.62121	0.2028
RGDP does not Granger Cause CAR		2.94033	0.0574
CDR does not Granger Cause RGDP	106	0.08447	0.9191
RGDP does not Granger Cause CDR		0.84052	0.4345
NPL does not Granger Cause RGDP	106	1.76209	0.1769
RGDP does not Granger Cause NPL		7.20922	0.0012
IEFFI does not Granger Cause RGDP	106	4.05032	0.0203
RGDP does not Granger Cause INEFFI		4.88180	0.0095
PEFFI does not Granger Cause RGDP	106	3.45210	0.0355
RGDP does not Granger Cause PEFFI		23.6886	0.0000

The null hypothesis that ROE does not granger cause economic growth was accepted whereas causality goes from economic growth to return on equity was rejected. This relationship is contradict the result of Flamini et al [190] who stated that GDP growth is not necessarily positively related with bank performance. The Granger causality tests indicate that NPL leads RGDP given that the hypothesis that NPL does not cause RGDP is accepted whereas RGDP does not cause NPL is rejected. The study found that real GDP was related to NPL levels in Nepal. This suggests that commercial banks are not responsive to changes in real GDP in Nepal. Granger causality test determine the credit quality of banks by assessing the overall asset quality with association of credit risk and provided that Real GDP growth is the main driver of non performing loans during the study period.

The Granger causality test performed with two lags indicates that CAR does not granger cause RGDP is accepted whereas RGDP granger cause CAR is rejected. It means economic growth leads the capital adequacy ratio. A higher credit-deposit ratio in an economy reveals that there is still scope for further development in various sectors

and more credit is channelized through the monetary agents. CDR does not granger cause RGDP is accepted and RGDP does not granger cause the CDR is also accepted. It implies that liquidity risk is not effect on economic growth nor economic growth effect on liquidity risk.

The link between technical efficiency under intermediation approach and economic growth shows that bidirectional causality which means technical efficiency under intermediation approach leads to economic growth and economic growth also leads to efficiency. If commercial banks are efficient, they will retain a smaller proportion of saving, and therefore a greater amount of resources will be devoted to productive investments. The more efficient the bank is, the lower the premium resulting in cheaper credit available for investment, which promotes economic growth. On the other hand, lower bank efficiency and larger margins harm economic growth since a greater proportion of saving is retained by the financial institution. Looking at technical efficiency under profit oriented approach there is two way causality. This results suggested that profitable efficient commercial banks does effect the economic growth and RGDP growth also effect the banks efficient.

6.3 Chapter summary

Unit root test confirmed the non-stationary of all the variables at level whereas stationary at the first difference. Regression results indicate that deposits and assets have significant impact on the economic growth of Nepal while loan and advances was not significant impact on the economic growth. On the other hand, the results of Granger Causality models reveal that growth in the economic activities in Nepal (represented by RGDP) did not seem to Granger cause the deposit, loan and advances and assets. It might be either the size of market is too small. Most of the banks are highly concentrated in urban areas, particularly in Kathmandu valley and even more, particularly in city centers and commercial banks might not be efficiently transforming deposit into loan and that most of the loan they grant might not be for productive purposes. The consequences allied sound with the apriority prospect and set the

healthier performing commercial banking industry was currently serving Nepal to attain superior growth rates. As a result, it is required to grant an appropriate operating situation for the banking industry to execute its services in Nepal.

A number of recently published papers have focused on the relationship between financial development and economic growth in Nepal. This study has, however, empirically investigates how bank risk management factor, technical efficiency under intermediation approach and technical efficiency under profit-oriented approach effect on economic growth during 2005-2010 using Granger causality test. It was found that relationship between performance of the commercial bank and its efficiency has an effect on the economic growth during the study period except credit to deposit ratio which is proxy for liquidity risk due to cause of credit markets are still underdeveloped and their contribution to economic growth is limited owing to a lack of financial depth. According to these findings, the efficient banks with ability to manage risks have more effect on economic growth.

Conclusions

The dissertation aims to investigate the performance and efficiency of the Nepalese commercial banks and link commercial banking financial indicators with economic growth in Nepal. It intends to explore the following major questions: What are the significant determinants of the commercial banking performance? What are the impacts of risk management factors on profitability? How do technical, pure technical and scale efficiencies show a discrepancy for individual commercial banks? Do the above efficiencies differ across the bank ownership categories? What are the effects of risk management factors on the banking efficiencies? Do the efficiencies under intermediation as well as profit-oriented approaches provide consistent outcomes? Whether or not commercial banking financial variables have significantly been affecting economic growth in Nepal? In order to demonstrate the strength of risk management, the CAMEL Model was used whereas Multiple Regression Method was employed to identify key elements that have impacts on the performance of the commercial banks. Furthermore, Data Envelopment Analysis Model was utilized to examine different types of the efficiency for the Nepalese commercial banks under intermediation and profit oriented approaches. In order for exploring the effects of risk management factors on the efficiencies, this investigation has been followed with a Tobit Model. Finally, the relationship between the financial indicators with economic growth in the term of GDP was illustrated by employing Granger Causality Test.

Findings of the study

1. From the above analysis, the study concluded that there was no same rank for a bank under different financial ratios. The same bank had different ranks. Overall performance of the public sector banks was not sound compared to joint venture and domestic public banks. High overhead costs, political interventions, poor management and low quality of collateral created continued deterioration in the financial health of the public sector banks.

2. Furthermore, the study revealed that the capital adequacy ratio, interest expenses to total loan and net interest margin were significant but had a negative effect on return on assets whereas non-performing loan and credit to deposit ratio did not have any substantial effect on return on assets. The capital adequacy ratio positively influenced the return on equity but the non-performing loan, credit to deposit ratio, interest expenses to total loan and net interest margin had no significant effect on return on equity. Moreover, non-performing loans to total loans was negatively related to both performance indicators. This indicated that poor asset quality or high nonperforming loans to total asset were concerned with the poor banking performance. To sum up, the study found evidence that bank specific factors contribute to ROA and ROE performance.

3. We drew a conclusion that Nepalese commercial banking industry was technical inefficient in the whole by Data Envelopment Analysis method. However, the degree of technical efficiency for the commercial banks of Nepal were lower than the degree of scale efficiency, which indicated that a portion of the overall inefficiency was due to producing below the production frontier rather than producing on an inefficient scale. The pure technical inefficiency of the Nepalese commercial banks was higher than the scale inefficiency .This implies that pure technical inefficiency might be the main reason behind technical inefficiency in the Nepalese banking sector. Concerning the ownership, the public sector banks were less efficient than the private banks because of weak management, high overhead expenditures and unnecessary political interventions. Tobit regression results disclosed that the efficiency differences were affected by the risk management factors. In order to enhance the performance of the commercial banks, they are needed not only to reduce the inputs to achieve the efficiency frontier, but also to consider the effects of risk management factors.

4. Regression results indicated that deposits and assets have significant impact on the economic growth of Nepal whereas loan and advances was not significant impact on the economic growth. Although the commercial banks assets has been increased but none of the expectations of the liberalization have been achieved. The relation of risk management factors of the bank and its efficiency was positive and

statistically significant related with economic growth except liquidity risk, expressed as credit to deposit ratio. This can be attributed to the fact that commercial banking in Nepal has not strategically positioned banks to adequately mobilize enough deposit that would impact on the economy.

Suggestion and recommendations

Following suggestions can be provided for future works as well as improving performance of the financial sector in Nepal:

1. The banks are required to maintain improved capital structure by increasing equity base and keep up low non-performing loan whereas capital risk should be concerned seriously. Future research could incorporate macroeconomic variables such as GDP, inflation and exchange rates.

2. It is beneficial for Nepalese commercial banks as well as bankers not to highly give attention to only in urban centers, also expand their effective services in rural area to efficiently transforming deposit into loan as well as utilizing granted loan for productive purposes with risks competence.

3. It is recommended to apply the DEA analysis for economic sectors other than banks, such as insurance companies, it will give new insights about their indicators of efficiency and will help in the strategic planning.

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