IMPACT OF SUPERVISION ON RISK MANAGEMENT: A STUDY OF COMMERCIAL BANKS IN NEPAL USING CAMELS

A Research dissertation submitted to

Kathmandu University School of Management

in partial fulfillment of the requirement for the

Degree of Master of Philosophy (MPhil) in Management

Hari Gopal Risal

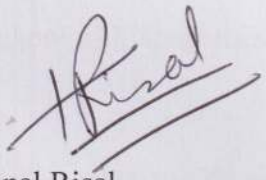
KU Registration Number: 017597-14

Kathmandu, Nepal

October, 2018

DECLARATION

I hereby declare this dissertation entitled *Impact of Supervision on Risk Management: A Study of Commercial Banks in Nepal Using CAMELS* embodies the original research work that I carried out in partial fulfillment of the requirements for the degree of Master of Philosophy (MPhil) in Finance of Kathmandu University of Management and that this dissertation has not been submitted for candidature for any other degree.



Hari Gopal Risal

October, 2018

RECOMMENDATION

This is to certify that Hari Gopal Risal has completed his research work on *Impact of Supervision on Risk Management: A Study of Commercial Banks in Nepal Using CAMELS* under our supervision and that his dissertation embodies the result of his investigation conducted during the period he worked as an M.Phil. candidate of the School of Management. The dissertation is of the standard expected of a candidate for the degree of M.Phil. in Management and has been prepared in the prescribed format of the School of Management. The dissertation is forwarded for evaluation.

Dissertation Advisory Committee

1. Chair — Prof. Dr. Devi Prasad Bedari
2. Member — Assoc. Prof. Sabin Bikram Panta

October, 2018

KATHMANDU UNIVERSITY
SCHOOL OF MANAGEMENT

APPROVAL

We have conducted the viva-voce examination of the dissertation *Impact of Supervision on Risk Management: A Study of Commercial Banks in Nepal Using CAMELS* by Hari Gopal Risal and found the dissertation to be original work of the candidate and written according to the prescribed format of the School of Management. We approve the dissertation as the partial fulfillment of the requirements for the degree of Master of Philosophy (MPhil) in Management.

Evaluation Committee

1. Prof. Bijay K.C.	Chair, Research Committee
2. Prof. Devi Prasad Bedari	Member, Research Committee
3. Prof. Sunity Shrestha	External Examiner

October, 2018

...ohne Tole, Sasatancha
...bur, Nepal
...Box 6250, Kathmandu)
...5548891, 5544078
...977 1 5533814
...mail: info@kusom.edu.np
...: www.kusom.edu.np

KUSOM
Ahead in Management

ACKNOWLEDGEMENTS

I am highly indebted to Professor Dr. Bijay K. C., Dean of the school, Prof. Dr. Devi Prasad Bedari, Director of Research degree programs, Mr. Nar Bahadur Thapa, Executive Director at Nepal Rastra Bank (NRB) and Associate Professor Sabin Bikram Pant, for their continuous guidance and motivation. Their guidance helped me a lot to acquire the proper perspective and a clear insight on the process.

I sincerely acknowledge the help, support, guidance and suggestions I have received from all my friends, colleagues and seniors during the completion of this proposal. My special thanks goes to Mr. Dirgha Rawal, Director of Nepal Rastra Bank for his encouragement, inputs and feedback from the initiation to completion of this report. I must thank Mr. Ashim Acharya, my fellow scholar who helped in data mining part. Finally, my colleagues Ms. Nisha Adhikari, and Mr. Rojesh Basnet, Ganesh Lamichhane and Chandra Kant Sapkota who helped in finalizing my methodology and necessary inputs for the study.

I must not forget Professor Subarna Lal Bajracharya, Dr. Biswo Poudel, Mr. Dipesh Karki and who continuously encouraged and helped in finding appropriate research papers for review and planning for relevant advanced econometrics tools for the analysis. In addition, I must thank my friend Mr. Prem Raj Adhikari for reviewing my initial draft, providing valuable feedback and helping for editing, formatting and necessary improvements. Two very important individuals I need not forget are my wife Ms. Subhechha Panta and daughter Ms. Aadrika Risal; for their sacrifice, encouragement and support from enrolment into M.Phil. program to completion.

Last but not the least; I would also like to thank Kathmandu University School of Management for providing valuable opportunities and a platform for submitting

this dissertation for discussion and feedback. Finally, I take the responsibility for any errors and deficiencies in the dissertation and expect valuable feedback from the reader for further improvements.

Hari Gopal Risal October, 2018

ABSTRACT

Safe and sound financial system is one of the key indicators of prosperity and growth of the economy. Financial crisis 2007-2008 followed by Lehman brother collapse has highlighted the importance of adequate bank regulation and supervision. The supervisory role of central bank has always been very crucial to foster the overall banking system, nurture the governance, ethics and manage the riskiness of banks to protect the interest of depositors and investors. Designing of best guidelines and practices of appropriate tools do not just help them manage risks but also help them to perform better, grow to the desired level and maintain stability.

This paper uses the secondary balanced panel data from all 28 commercial banks in Nepal to provide empirical evidence on the role of supervision on risk management. The study of the relationship between banking supervision and risk management continues to be a fundamental issue in the literature of corporate governance, profitability and risk management. Findings of such literature are often inconclusive.

The main contribution of this study is the analysis of banking supervision effects on risk management in banking industry. This study establishes the relationship by using the generalized method of moments (GMM) using Arellano-Bover /Blundell-Bond Estimation. Worldwide applied supervision parameters CAMELS variables are used as a regressor for all commercial banks in Nepal over the period 2004-2015.

Using the secondary balanced panel data, this study has been able to establish the causal relationship between CAMELS supervision (i.e., Capital Adequacy, Assets Quality, Management Efficiency, Earning Performance, Liquidity and Sensitivity) on

risk management of commercial banks in Nepal as measured by downside deviation and standard deviation of ROA and ROE. Amongst the CAMELS variables, assets quality has been identified as the most important contributor for risk management followed by management efficiency, liquidity and earning efficiency. However, the contribution of capital adequacy and sensitivity to market risk are found to be negligible. Further, the ownership and Basel II dummies are found to be insignificant along with macroeconomic variables (i.e., GDP growth rate and CPI).

Keywords: risk management; supervision; capital adequacy; assets quality; management efficiency; earnings; liquidity; sensitivity to market risk; GDP; CPI; commercial banks; Nepal Rastra Bank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATION

AR	Autoregressive
BFIs	Bank and Financial Institutions
CAL	Capital Adequacy, Assets Quality and Liquidity
CAMELS	Capital Adequacy, Assets Quality, Management Efficiency, Earnings, Liquidity and Sensitivity to Market Risk
CAML	Capital Adequacy, Assets Quality, Management Efficiency and Liquidity
CD	Coefficient of Determination
CFOs	Chief Finance Officers
CPI	Consumer Price Index
DFID	Department for International Development
DPD	Dynamic Panel Data
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IV	Instrument Variable
KPMG	Klynveld Peat Marwick Goerdeler
MAIC	Modified Akaike Information Criteria
MBIC	Modified Bayesian Information Criteria
MQIC	Modified Quasi Information Criteria
PVARSOC	Panel Variance Autoregressive Lag Selection Of Condition
RMS	Risk Management and Stability
ROA	Return on Assets
ROE	Return on Equity

CHAPTER I

INTRODUCTION

Banks are the major actors in the economic system which contributes for consumption through liquidity, investment, entrepreneurship, financial markets and economic growth, (Bouheni et al., 2014). Development of the banking sector and well managed banking are the fundamental contributor to the overall development of the country and well-being of the society. At the same time, banking brings risk as we have witnessed several failures in the different part of the world. One of the prudent example is failure of Barings Banks; a merchant bank operated for about 200 years. Just because of one star performer 'Nick Leeson' and his rogue trading behavior wiped out the bank with a loss of one billion dollar in 1995. Similarly, a loss of 700 million dollar of 'Allied Irish bank', 500 million dollar loss of midland bank and one hundred and thirty million dollar loss of 'National Westminster bank are some major examples and lesson as how misinterpretation of role produces risk to banks and leads to debacles (Hull, 2014).

Supervision and regulations of banks and financial institutions is a continuous process of deciding on what activities central bank should permit or forbid banks in a market to perform and how. Panta and Bedari (2016), highlighted on regulations becoming more stringent in developing economies to controls on banking activities to meet social and economic objectives of development (for example, Deprived Sector Loan in Nepal), and with fear of them being wanton leading to bank failures. In addition, they have added on how bank failures are perceived to have widely pervasive, adverse effects on an economy and are considered to be more detrimental

than any other business failures, with their spillover effects overreaching outside the borders.

Nepalese financial system witnessed a rapid numerical growth after liberalization policy was adopted in early 1990s. Currently, there are about 177 banks and non- bank financial institutions operating with the NRB license. Out of which, 28 are "A" class commercial banks, 67 "B" class development banks, 40 "C" class finance companies and 42 are "D" class micro-credit development banks. Two "C" class institutions which are not in operation are in the process of liquidation. Besides, 15 saving and credit co-operatives and 28 Non-Government Organizations (NGOs) are also in operation with license for limited banking operations. The total branches of BFIs have reached to 4,274 (Nepal Rastra Bank [NRB], 2016).

Supervision and regulation has been key function of central banking to ensure stability and accountability of the banks and financial system. Supervisory role of central banks mainly focuses on risk management of banks to protect the interest of depositors as well as to build a mature financial system.

As stated in NRB (2015, 2016), safe, sound and self-regulated BFIs, transparent and consumer friendly banking transactions, adoption of international best prudential norms and best supervisory practices, mitigation of the systemic risks, and ultimately achieving the financial stability have been the aim of NRB as a regulator and supervisor. NRB's bank supervision function also aims at ensuring safe and sound banking industry in Nepal (NRB, 2015, 2016). As stated in the bank supervision report published by NRB, it has started risk based supervision approach since 2013. The earlier on-site inspection processes are gradually transforming to risk based approach. This approach is a process that allows assessing the overall risk of an institution on an ongoing basis, and take supervisory actions, if warranted. Although,

the process involves both onsite and offsite supervision, offsite supervision manual is yet to be developed and implemented.

Compliance based supervision to risk based supervision is a notable shift in supervisory approach. Furthermore, to diagnose the banking industry further, NRB has started special inspection process with the technical assistance of World Bank and DFID utilizing the expertise of KPMG, Portugal (NRB, 2016). This special inspection program has provided a valuable feedback to customize the regulatory and supervisory landscape for the coming years. Supervision is a distinct component of bank regulation that involves more than monitoring compliance with minimum capital, liquidity or other quantitative regulations.

Bank examinations identify weaknesses in bank operations that lead to supervisory recommendations to improve bank safety and soundness. Litan and Hawke (2012) stated that examiners are experts who are specially trained to look beyond the numbers, seeking to determine whether the processes that banks use to gather deposits, extend loans, manage risk, and keep track of all this information and to ensure its security, are appropriate. To carry out their jobs, examiners ask questions of bank employees, executives and directors; with an eye to ensure that the bank is well managed and appropriately managing risks.

Loss of banks and inability to manage risk faced by the banks has direct impact to depositors and different stakeholders. A central bank's major function is to protect depositors' interest and help develop a sound and reliable financial system. In addition, good supervision should help the banks to reduce their risk, maintain stability and improve returns. In USA, bank supervisors have a continuous physical presence at the largest banks and conduct onsite examinations of every bank at least every 18 months (Bouheni, 2013). In addition, supervisors assess quantitative and

qualitative aspects of bank management and performance including asset quality, earnings, bank sensitivity to market and interest rate risks, as well as the adequacy of bank management control systems and management competency.

The study contributes to the literature of banking supervision and risk management in following ways: firstly, it uses four accounting ratios: downside deviation and standard deviation of return on equity and return on assets to explain the riskiness of all commercial banks in Nepal. Secondly, it investigates the correlation between banking supervision parameters measured by CAMELS and risk management, using Arellano-Bover / Blundell-Bond Estimation for balanced dynamic panel data (DPD) and a dynamic system General Method of Moment (GMM) specification. Proxies for supervision have been identified as per the widely used supervision tool CAMELS parameters. The CAMELS framework can trace its roots to 1979, when the Uniform Financial Institutions Rating System (UFIRS) was implemented in US banking institutions, and later globally, following a recommendation by the US Federal Reserve (Bauer et al., 1998). This system became internationally known with the abbreviation CAMELS, reflecting five assessment areas: Capital Adequacy, Asset Quality, Management Efficiency, Earnings Performance, Liquidity and Sensitivity. The Basel Committee on Banking Supervision of the Bank for International Settlements (BIS) has recommended using capital adequacy, assets quality, management quality, earnings and liquidity (CAMEL) as criteria for assessing a FI in 1988 (ADB 2002). The sixth component, sensitivity to market risk (S) was added to CAMEL in 1997 and altered the acronym to CAMELS (Gilbert, Meyer and Vaughan 2000).

Problem Statement

The origins of the recent global financial crisis 2007-2008 have been associated with banking failure, the liquidity crisis and credit crunch (Bouheni et al., 2014). Although Nepal has not faced much during the crisis, it has been regularly facing credit crunch and high interest rates. However, some of the difficult situations faced by local banks and financial institutions cannot be undermined rather they can be learnt as good lessons.

With proliferation of financial institutions, there came challenges of regulating and supervising these institutions. In terms of challenges, there are mixed arguments among experts as some argue that banks misinterpreted their role whereas others have to say ignorance and lack of proper supervision of NRB. Sapkota (2011) highlighted on NRB's ignorance on unhealthy competition, questionable lending to a few sectors as well as governance in financial sectors. He also added on how Vibor Bikas Bank created a panic situation in 2011 and requested NRB for money injection or management takeover to save the rattled banking sector. Other examples of banks' failure needing improvements in regulation and supervision were liquidation of Nepal Development bank, Samjhana finance, Gurkha Development bank etc. Even an extreme fraud of fake good for payment of H & B Bikash bank in 2012 for about 425 million could happen. All above fiasco and some news about Nepal Bangladesh Bank's cheque clearing issue in 2005, unproductive lending of Grand Bank, Kist Bank, Oriental Finance are sufficient to explain the misinterpretation of BFI's role and required a more active role of NRB. NRB's shifting from earlier compliance based supervision to risk based supervision from 2013 seems to be an indication of better risk management framework in Nepali banking sector. Although NRB has adopted risk based supervision approach for on-site supervision, it demands proper

guideline and practices for off-site supervision as well. On top of that prioritization among categories used would benefit the BFIs to check and limit their potential risks.

The supervisory authority NRB has also reported several problems with the commercial banks. Some problems reported are errors in calculation of risk weighted exposures, weak infrastructure to implement capital adequacy framework, loan exceeding the single obligor limit (SOL), weak mechanism to monitor single obligors, and irregular and inadequate credit monitoring plus loan loss provisioning. In addition, poor analysis of rate sensitive assets and liabilities, weak board oversight on the overall risk management practices, lack of approved risk exposure limits and appetites, lack of comprehensive risk management policies, inadequate manuals and guidelines for risk identification, measurement, monitoring and control of the inherent risks, lack of contingency plans and gap limits (liquidity and re-pricing) were also indicated as part of problem (NRB, 2015, 2016).

All reported problems evolved along with rapid growth of banks and diversified services offered. Those services made banking an integral part of individual and institutions for regular transactions to major transaction. Hence, enhanced supervision and regulation, priority on supervision parameters, lessons from crisis has increased the need of study in this area. The literature in banking failure, performance, banking supervision and regulation, risk management and governance has gradually improved in the recent days.

However, available literatures in risk management and supervision are very contradictory and incomplete despite their huge importance. There are arguments which claims supervision positively affects in risk reduction of banks. Demirguc et al. (2008); Beck et al. (2004); and Chortareas et al. (2012) commonly found that banking supervisory reforms were positively associated to the performance and the stability of

banks. Above finding gives an opportunity to conduct research in different part of the world. This study is carried out to see whether it holds true in case of Nepal or not. Besides, if supervision helps in reducing the riskiness of banks, what works best will be the secondary objective.

In contrast to above arguments in favor of supervision reducing riskiness of banks, few studies have shown reverse impact. It is not just the supervision which reduces the risk of banks, the pro-activeness and precautions taken by banks may also reduce the riskiness. The powerful supervisors and strict supervision may exert a negative influence on bank performance by using their supervisory powers to benefit favored constituents, attract campaign donations, and extract bribes (Levine, 2011). However, Barth et al. (2001) has evidenced mixed impact of regulatory restrictions on bank performance. Hence, assessment of supervision practice, tools used by supervisors and their impact on downside risk reduction and stability are the matter of concern to all stakeholders.

Existing evidence on the relationship between different types of supervisory practices, and bank performance is rather limited and most of it typically relies on standard accounting measures of bank performance (Barth et al., 2003; Naceur & Omran, 2011; Chortareas et al., 2012). In most studies, specific variables of banks such as bank size, credit risk, capital bank ratio and equity are used as internal determinants of bank performance. Size is included to assess the existence of economies or diseconomies of scale in the banking sector. The empirical results provide conflicting evidence. In addition, very limited literature have been found in local context to uncover the riskiness of banking and their supervision.

Similarly, available research in the field of supervision and regulation has not been able to establish the impact of supervision on risk management using CAMELS

framework. Most of the past studies have covered only partial components like CAMEL or, CAL or those which have covered all CAMELS variables were also unable to establish the causal relationship of supervision with banks' risk management. Similarly, this study makes a comparative analysis of riskiness of joint venture and locally owned private banks with the government owned banks. Further, the study introduces macroeconomic variables such as inflation and GDP growth to control the macroeconomic impact on banking fragility. Moreover, this study covers the considerably longer period (i.e., from 2003-04 to 2014-15) for all commercial banks during the significant changes in banking and financial developments. Unique dataset, consideration of total population, sufficient data, inclusion of variables representing both the on-site and off-site supervision, and robust model based on relevant variables will add to the existing body of knowledge.

With an ultimate goal of reducing risk among BFIs, NRB has been tightening on supervision side lately through different initiatives such as risk based supervision, adoption of Basel III, standardized approach for credit risk, financial sector stability programs and contingency management framework etc. Hence, the effectiveness of supervision & regulations can therefore be gauged through reduction of risk in BFIs. In this context, this study would serve as a testimony for NRB and commercial banks. In addition, attention to risk, supervision parameters considered for several years, their ranking in risk evaluation and casual relation between supervision parameters and their contribution in risk reduction will be the major gaps of this study.

Significance of the Study

Nepalese practice of bank supervision is highly similar to the best practices of the world as NRB is practicing both the on-site and off-site examination using the mix of both quantitative and qualitative measures to examine and suggest for remedies and

immediate action. For the sound financial system and importantly to protect the depositors' interest NRB has recently drafted guidelines for risk based supervision for on-site supervision, which is well aligned with the existing compliance based supervision. NRB has been given the supervisory rights for regular and need based supervision as per Nepal Rastra Bank Act, 2002, Bank and Financial Institutions Act, 2006, Company Act, 2006, Nepal Rastra Bank Inspection and Supervision By-laws, 2013, Unified Directives to licensed institutions 2015, Monetary Policy Announcements, Assets (Money) Laundering Prevention Act, 2008, And Guidelines issued by NRB (2015).

This study helps NRB to assess its existing mechanism for supervision, assign appropriate weights to different parameters and make necessary changes as suggested by the study if any. It's finding maybe appropriate reference for NRB while designing the off-site supervision guidelines. Similarly, commercial banks in context of Nepal are found to be the safest place to deposit money since none of them have been liquidated. However, few development banks could not manage their risk level and liquidation took place. The experience of commercial banks so far is manageable but four out of thirty two have been merged into some other commercial banks; which also gives a sense of riskiness of commercial banks too. On the other hand, stocks of commercial banks share a significant ratio in the secondary market. Hence, this study will be a significant contribution to the NRB, commercial banks, existing and potential depositors and the participants of stock markets.

Objectives of the Study

It has been evidenced that the study on Bank supervision and regulation is a matter of continuous study and improvements. Several problems pointed out by NRB and shifting towards risk based supervision also makes it clear that the best practice,

continuous monitoring and guidance are necessary for smooth banking and good governance. Being very precise, this study carries out the following:

1. To examine the impact of supervision parameters on banks' risk management.
2. To rank the supervision parameters based on their contribution to risk management.

Research Hypothesis

To provide empirical evidence on impact of supervision on banks' risk management, this study has tested the following hypothesis:

H1: Bank supervision positively affects banks' risk management.

H2: CAML supervision parameters have stronger impact on banks' risk management.

Organization of the Report

This research is organized in five chapters. The first chapter includes background, statement of problem, and objective of the study, research gap and significance of the study. Chapter two includes the literature review on impact of supervision on risk management. It also incorporates related theories, the findings of the previous researcher and different perspectives proposed by various scholars. Chapter three presents details of the research methodology. It includes detailed description of research design, secondary data, methods and models used in the study.

Chapter four deals with the result and findings obtained from the data analysis of the study. Finally, the study concludes with chapter five which includes summary of the findings and discussions, implication of the research along with future scope of the study. A reference list and appendixes have been kept at the end of this dissertation.

CHAPTER II

LITERATURE REVIEW

This chapter focuses on the theoretical concepts, empirical review and theoretical framework. Literature review has an organizational pattern and combines both summary and synthesis, often within specific conceptual categories. A summary is a recap of the important information of the source which examines the various concepts and theories that have been put forwarded. Then moves to empirical literature in which relevant empirical works of authors have been reviewed for this study. At the end of this chapter, conceptual framework is presented in which research idea is organized for achieving research objectives.

Conceptual Review

Bank Supervision and Risk Management

The NRB banking supervision and banking regulations functions play a crucial and anticipatory role in identifying weaknesses and problems. It may emerge within a licensed institution, with the primary purpose of preventing the institution from becoming a potential threat to the stability of the banking system or the Nepalese financial system (NRB, 2016). Such threats may damage public .confidence in the banking system, and tarnish the reputation of all licensed institutions. The erosion of public confidence may not only impact the soundness and stability of the financial system, but could also severely impede the growth of Nepalese economy.

Dang (2011) stated that CAMEL is a useful tool to examine the safety and soundness of banks, and help mitigate the potential risks which may lead to bank failures. In addition, the study has found CAMEL as a useful supervisory tool in the

U.S. and argued that the approach to be beneficial internationally and offers flexibility between on-site and off-site examination of banks.

Further, the banking supervision mainly ensures that the commercial banks operate in a safe and sound manner, and do not take the excessive risks. It also ensures that the banks are operated in accordance with federal banking regulations as the Fed examines safety and soundness of financial stability in banks through the onsite examination supported by CAMEL rating with offsite monitoring (Bernanke, 2007).

Gilbert et al. (2002) have highlighted on how off-site surveillance is based on the call reports produced by the bank supervisory agencies for the quarter prior to the examination.

Risk Based Supervision

Risk based supervisory approach is a process that allows for assessing the overall risk profile of an institution on an ongoing basis, and to take supervisory actions, if warranted. This process involves both onsite inspections and offsite supervision, which feeds into the development and maintenance of an institution's risk profile. The risk-based methodology consists of major events that complete the supervisory cycle, and allows for the development and maintenance of an institution's risk profile (Stewart, 2009). The risk profile summarizes the composite and component CAMELS. The first major event in the supervisory cycle is the risked-focused inspection and CAMELS Rating.

CAMELS Rating System and Risk Based Supervision

The CAMELS rating system is an internationally recognized framework for assessing Capital adequacy, Asset quality, Management, Earning performance, Liquidity and Sensitivity to market risk (Sarker, 2005). The CAMELS rating system

is designed to assess in a comprehensive manner an institution's financial condition, compliance with laws and regulations, risk management systems and overall operating soundness. Its primary purpose is to help identify those institutions where weaknesses in the aforementioned areas require special supervisory attention or warrant a higher than normal degree of supervisory concern (Dang, 2011).

Although capital adequacy rules specify on size of capital each bank should hold they may not truly reflect on risks involved unintentionally and their appropriateness. In addition, inadequate capital may increase the chances of bank failure whilst excessive capital may increase the costs on banks. Furthermore, economic theory provides conflicting predictions about the impact of regulatory and supervisory policies on bank performance (Barth et al., 2010).

Barth et. Al. (2010), also highlighted rationales behind Basel II implementation in 2007. Some of those rationales highlighted were pillars of minimum capital requirements, supervisory review, and market discipline.

Further, evidences suggest that there is a strong link between various forms of banking regulation and supervision and bank efficiency. Amongst many, one pertinent function of capital is to share the risk which views capital as a buffer for orderly disposal of assets and in order to save debt holders from losses. If capital is adequate then assets will not have to be sold in 'fire sale', a situation that would affect both depositors' losses and, consequently, deposit insurance. Another key function of adequate capital is to provide owners and managers with incentives to take less risk (Gale, 2010).

Nevertheless, there are disagreements between analysts on the imposition of a minimum capital requirement assuming reduction on risk-taking incentives (Blum, 1999). Official supervision can reduce market failure by monitoring and disciplining

banks thus weakening corruption in bank lending and improving the functioning of banks as intermediaries (Beck et al., 2006).

According to Barth et al. (2010), there is no statistically significant relationship between capital stringency, official supervisory power, bank performance and stability. Previous empirical evidence on capital requirements tends to find a positive relationship with bank efficiency but in general the nature of this relationship is not straightforward.

Another fundamental factor in banking is the quality of assets. Abata (2014) highlighted loans and advances, loan loss provisions and non-performing loans are major variables to determine the assets quality of a bank. His study on the impact of assets quality on bank performance in Nigeria used the ratio of classified loans & advances (overdue loans) to total loan portfolio (LLR) and total loan to total assets ratio as measures of assets quality.

Bloem and Freeman (2005) argue that there is no single definition of a nonperforming loan. Country definitions differ, and that what is appropriate in one country may not be so in another. According to the Dang (2011), a loan is nonperforming when payments of interest and/or principal are past due by 90 days or more.

Empirical Review of Previous Studies

The existing evidence on the relationship between different types of supervision tools, their execution and bank performance are limited as well as relied on standard accounting measures of bank performance (Barth et al., 2003; Chortareas et al., 2012). Studies have examined the effect of regulatory and supervisory policies on banking sector crises (Demirguc & Detragiache, 2002; Chortareas et al., 2012) and banks' risk-taking behavior (Laeven & Levine, 2009). Their study have also

highlighted on banking supervisory reforms to have were positive association with the performance and the stability of banks. Powerful supervisors may use their powers to benefit favored constituents, attract campaign donations, and extract bribes (Levine, 2011). Further, powerful supervision was found to be positively related to corruption rather than improving bank development, their performance and stability.

Further, Dang (2011) argues that the bank supervision has been increasingly concerned due to significant loan losses and bank failures from the 1980s till now. Moreover, the financial market has changed dramatically over years, it is in need of the thorough bank examination including on-site and off-site examination, of which the CAMEL rating model plays a crucial role in the supervisory process.

Hays, Stephen, and Arthur (2009) analyze the efficiency of community banks in the United States using data from year-end 2006-2008.They have developed a multivariate discriminant model based on the CAMEL(S) model, to differentiate between low efficiency and high efficiency community banks by using the efficiency ratio as the independent variable. The results on the significance of the individual CAMEL components provide mixed results for different periods apart from the sensitivity to market risk, which is found to be statistically insignificant. However the Wilks' Lambda and X2 indicate the overall model is highly significant at the p=.000 level in all three periods from 2006-2008. Sarker (2005) had scrutinized the CAMEL model to check the regulation and supervision of Islamic banks by the central bank in Bangladesh.

Dilek, Suat, and Mine (2011) employed Economic Value Added (EVA) measurements as a performance indicator for Turkish banks listed in Istanbul Stock Exchange for the period of 2006-2010. The results indicate that a high ROE as

depicted by high amount of net income to total equity does not necessarily create sufficient amount of economic profit.

Bouheni, Ameur, Cheffou, and Jawadi (2014), showed the effects of regulatory and supervisory policies on profitability and risk-taking for European banks over the period 2005 to 2011. For which they have used the data from Bankscope (2012) for banking financial factors; the Bank regulation and supervision database from the World Bank for banking supervision and regulations. In terms of methodology, they have applied the two-step dynamic panel data approach suggested by Blundell and Bond (1998) and used the GMM method to address potential endogeneity, heteroskedasticity, and autocorrelation issues in the data (Doytch & Uctum, 2011). They investigated the effects of regulatory and supervisory policies on profitability and risk-taking using large sample of the biggest European banks in a context of financial crisis and economic downturn from 2005 to 2011. It was based on original sample of regulatory, supervisory and profitability proxies and carried out back tested panel data regression model.

The model used in their study was as:

$$\begin{aligned} PERFi,t \;=\; & \beta o + \beta_1 (PERF)i,t-1 + \beta_2 (RESTRICT)i,t + \beta_3 (DEP\_INSR)i,t \\ & + \beta_4 (CAP\_ADQ)i,t + \beta_5 (SRP)i,t + \beta_6 (ISA)i,t + \beta_7 (BS)i,t \\ & + \beta_8 (CAR)i,t + \beta_9 (LLGL)i,t + \beta_{10} (NTLA)i,t + \beta_{11} (NPL)i,t \\ & + \beta_{12} (INSQ)i,t + \beta_{13} (FD)i,t + \beta_{14} (CPI)i,t + \beta_{15} (GDP)i,t + \varepsilon i,t \end{aligned}$$

PERF refers to the performance of banks using ROA, volatility of ROA measured by standard deviation, ROE, volatility of ROE measured by standard deviation and Z-score for bank's stability. Lag of PERF, restriction imposed, deposit insurance, capital adequacy, supervisory power, independence of supervisory authority, bank size, capital to assets ratio, loan loss reserve to gross loans, net loan to total assets, non-performing loans have been used as internal factors affecting

performance. Further, external control variables as quality of institutions, financial development, and consumer price index and GDP growth have been used to address the cross-country variations.

Their findings were as below: a. increasing European banking regulations and supervision could improve banks' profitability and decrease their risk-taking; b. however, the restrictions on banking activities decrease profitability, while capital adequacy and the deposit insurance system increase banks' profitability and c. Finally, reinforcing supervisors' powers reduces risk-taking and promotes banking stability. Those results can have different policy implications for bankers as well as for regulators in terms of improving regulatory measures and adapting them to the banking environment and financial context.

Bouheni (2013) has opined the Banking supervision to have an impact on banks' performance. However, the effect was found to be dismissed when they have introduced the macroeconomic variables, the institutional and financial development indicators. Those findings support the view that the implementation of such banking supervision differs greatly depending on the institutional environment and the country's politics. Further used the generalized method of moments (GMM in system), based on a sample of the ten largest European banks of France, Germany, UK and Greece over the period 2005-2011.

Aftab, Samad, and Husain (2015) used a unique aggregated bank level data set covering 60 years of financial history of the country. They have employed CAMEL parameters to measure effect of different bank specific factors on the profitability of banks in Pakistan. Where independent variable is earnings, return on equity and return on assets have used to measure the profitability. The independent variables used are total capital to total assets ratio to measure the capital adequacy, growth rate of assets

as the measure of quality of assets held of banks, the ratio between expenditures and income ratio to measure the managements' efficiency, and deposits to loans and advances ratio in measuring the liquidity maintained at bank. The vector Ct of control variables include growth rate of real Gross Domestic Product (GDP), growth rate of money supply (M2), and growth rate of branch network of banks. While modeling and analysis dummy variables have deployed to judge the impact of (a) ownership (private versus public) on banks profitability, and (b) political regime (democracy versus autocratic rule) on banks profitability.

They have offered an interesting relationship of profitability with CAMEL variables after controlling the effect of real GDP growth, growth of money supply and growth of bank branches (proxy for size).Quality of banking assets and management (i.e., AM) are found to have a positive relationship with bank's profitability whereas negative relation was observed with the liquidity and capital adequacy.

Jha and Hui (2012) made a comparative analysis of financial performance of commercial banks of Nepal during the period of 2005 to 2010. Following hypothesis have been tested to see the relationship of CAMEL variables with the bank's performance measured using ROA and ROE. Their study found the ROAs of public sector banks to be higher than those of joint venture and domestic public banks due to having utmost total assets. However, overall performance observed for public sector banks was not very sound as measured by ROE, CDR, and CAR; most of them were better with joint venture and domestic public banks. Further, high overhead costs, political interventions, poor management and low quality of collateral have found to deteriorate the financial health of the public sector banks. Following was the model they have employed to measure the performance was as:

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, X5- CDR- Credit to deposit ratio.

The values determined for the financial ratios reveal that joint venture and domestic public banks are also not so strong in Nepal to manage the possible large-scale shocks to their balance sheet. Their study offered the positive effect of capital adequacy ratio, interest expenses to total loan and net interest margin on ROA whereas, negative effect was observed between ROA and non-performing loan and no considerable relationship have been established with the credit to deposit and ROA. The capital adequacy ratio positively influenced the return on equity but no significant effect have been identified with the non-performing loan, credit to deposit ratio, interest expenses to total loan and net interest margin

Baral (2005) studied over a period of 2000/01 to 2003/04 made a comparative analysis of three joint venture commercial banks out of six banks available then. He has purely used the some of the CAMEL ratio analysis technique and compared their performance.

Under 'C' Capital Adequacy, leverage ratio, core capital ratio, total capital ratio and supplementary capital ratios have been measured. All sampled banks are found to have fair capital base and above the minimum requirement set by the NRB except in case of NSBI bank for the year 2000/01 and 2003/04 based on TCR and CCR. The 'A' Assets Quality, Non-performing loan ratio and loan loss reserve ratio have been measured. They indicate an improving trend on their quality of assets over the years and sound financial health condition. In case of 'M' management efficiency, operating expense ratio and earning per employee have been measured. Based on the comparative analysis of the ratios, SCBNL found to be the most efficient and NSBI as

least efficient and in overall joint venture banks are reasonably efficient. For 'E' earning performance, Return on Assets, Return on Equity and Profit Margins has been used. Grier (2007) opines that the consistent profit builds the public confidence in the bank and absorbs loan losses with sufficient provisions. As balanced financial structure provide shareholder reward hence consistently healthy earnings are essential to the sustainability of banking institutions. Earning efficiency measures the ability of a company to generate profits from revenue and assets.

Finally the liquidity position 'L' have been measured using loan to deposit ratio, cash and equivalent to total assets ratio, cash and equivalent to total deposit ratio and cash balance with NRB to total deposit ratio. Pradhan, Arvin, and Ghoshray (2015), have stated that the liquidity status of the bank plays important role in banking performance in case of Nepalese commercial banks.

Gupta (2014) has made an analysis of Indian public sector banks using CAMEL approach using the descriptive analysis for 26 commercial banks over a period of 2009 to 2013 using secondary data published by the RBI.

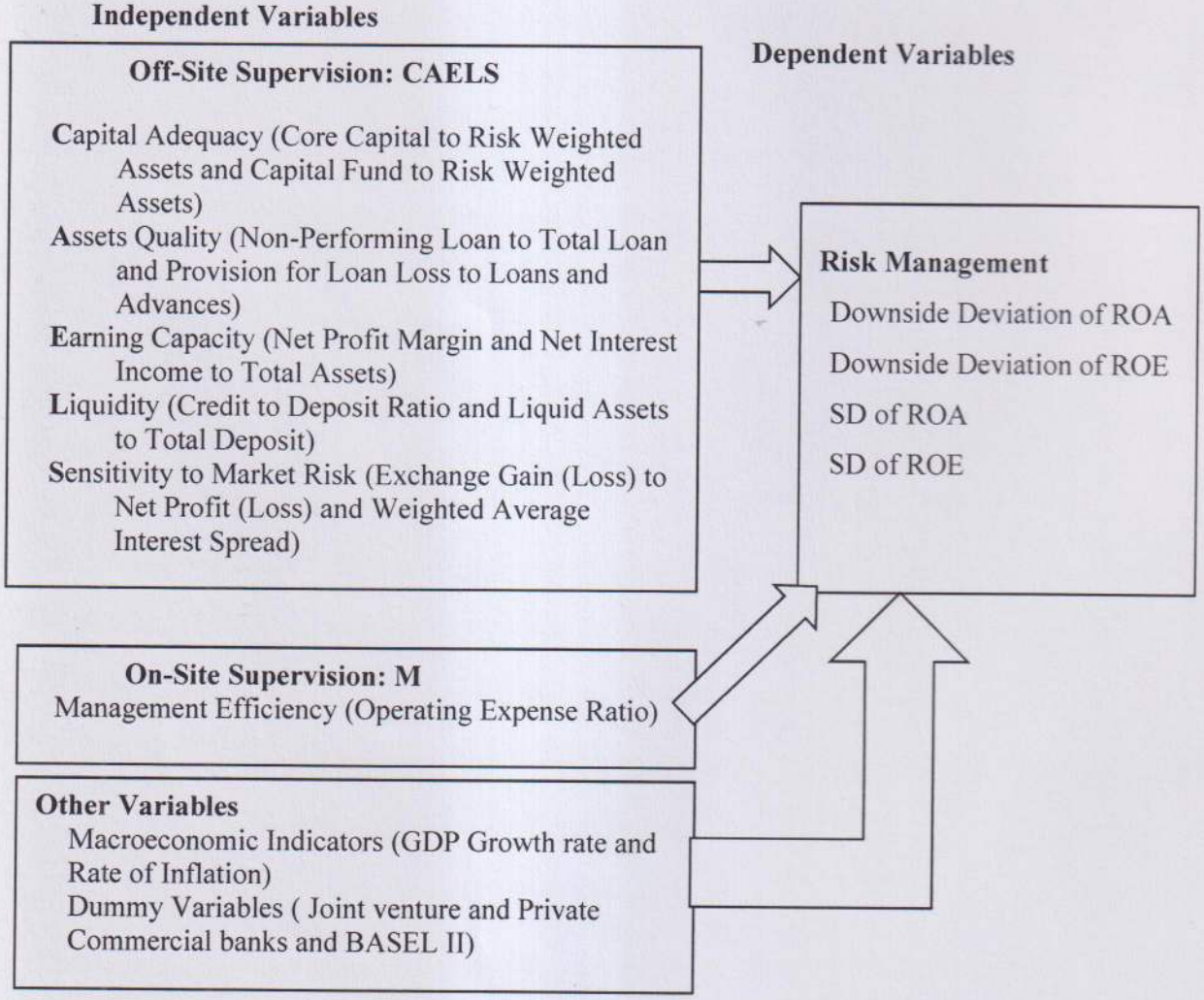
As per the mandate of NRB Act, 2002 and Bank and Financial Institutions Act, 2006; NRB regulates and supervises the BFIs. Regular supervision provides important information on the banking system which feeds the decision making process such as: formulation of monetary policy, updates on regulations and timely measures for financial stability (NRB, 2015).Some of the responsibilities of NRB's Supervision department is to execute the supervisory policies and practices as per governing laws, regulations and policies to commercial banks.

The supervision department prepares an annual supervision plan before the new fiscal year and supervises banks as per the approved plan. The supervisory process covers varieties of inspection including on-site inspection, special inspection,

targeted inspection, and monitoring inspection. The on-site inspection is applied at full-fledged. In addition, it is supported by an offsite supervision function which is responsible for the analysis of bank returns. The bank supervision department of central bank takes charge of carrying out inspection and supervision of all commercial banks (NRB, 2015).

Conceptual Framework

The following conceptual framework was used in this study:



As in the framework, the relationship has been tested between dependent and independent variables where dependent variables include risk management parameters like downside deviation and standard deviation of ROA and ROE while independent

variables includes all six components used in supervision (i.e., CAMELS includes Capital Adequacy, Assets Quality, Management Efficiency, Earning Performance, Liquidity and Sensitivity).

In addition, macroeconomic variables (i.e., GDP growth rate and inflation rates) are included to control their impact. Further, ownership dummies were included to for comparative analysis among government, joint venture and local private banks. Finally, Basel II dummy was used as the proxy of capital adequacy.

CHAPTER III

RESEARCH METHODOLOGY

Research Design

The research design for this study is quantitative. It used secondary data for the analysis. Using CAMELS variables of supervision a causal relation was established with the risk management of commercial banks in Nepal using regression methods. A dynamic and unbalanced panel data for a period of 12 years was used to find the causal relation.

Population and Sample

This study takes all commercial banks currently operating in Nepal in its sample. The increased capital requirement of commercial banks that encouraged merger and acquisition led to reduction in their numbers. Although total number of commercial banks currently operating is 28 after the merger, the study considers all 32 commercial banks available during the study period.

The study used secondary source of information. The secondary source constitutes the income statements and balance sheets of the banks, audited annual reports and financial statements for the recent 12 year period from 2004 to 2015. The data are extracted from the website of Nepal Rastra Bank. The period was chosen because it offered recent time series observations and constituted a period of major developments in the Nepali Banking system. The period also covers the entire period of BASEL II and few years of BASEL I.

Research Methods

To understand and explain the existing bank supervision practice in Nepal and to show their impact on risk management, this study has analyzed secondary data. Along with the information from previously published literatures, a discussion was been done with the supervision experts at the central bank as well as CFOs at commercial banks. The rationale behind this was to draw an appropriate construct to proceed with and validate the findings of secondary data.

This study has adopted balanced dynamic panel data analysis to meet its research objectives. One of the main advantages of Panel data is that it enables the researcher to control for unobserved heterogeneity, and secondly since panel data have both cross-sectional and time series dimensions, it provides the researcher with sufficient data points to reduce the likelihood of biasness in the parameter estimators.

We estimate the model by using Generalized Method of Moment GMM-in-system method developed by Blundell and Bond (1998). Bond et al. (2001) stated that the GMM dynamic panel data is capable to correct for unobserved heterogeneity, omitted variable bias, measurement error, and Endogeniety problems. The null hypothesis of no autocorrelation is applied to differenced residuals as captured by Arellano and Bond (AB) test started since 1991. In addition, this study uses the extended linear GMM estimator which uses lagged differences of dependent variables as instruments for equations in levels as suggested by Arellano and Bover back in 1995.

We also test for Autoregressive AR (2) in first differences, detect autocorrelation in terms of levels. The validity of the instrumental variables is tested using Hansen J test of over-identifying restrictions and over a test of the absence of serial correlation of the residuals. This test (Hansen, 1982) verifies the validity of

instrument subsets which is based on H0: residuals should be uncorrelated with instruments. When the H0 cannot be rejected, the validation of instrumentals is obtained. As our data contain 32 commercial banks, operating 28 after merger and acquisition, we use the method two-step GMM-in-System estimator.

System GMM developed by Arellano and Bover, 1995, and Blundell Bond, 1998, and the method is considered superior than difference GMM. Bond et al., 2001, argue this model is able to correct unobserved heterogeneity, omitted variable bias, measurement error, and Endogeniety problems.

As suggested by Arellano and Bond (1991); Arellano (1995) and Blundell and Bond (1998), following two test are performed; first, Sargan/Hansen test for over-identification restrictions which tests for overall validity of the instruments and the null hypothesis is that all instruments as a group are exogenous. Secondly, the null hypothesis that error term is not serially correlated particularly at the second order (AR2).

As suggested by Anees, Saqib, and Memon (2008), GMM should be applied for more than 5 time periods and cannot be applied for very long time period data. In addition, Generalized Method of Moments (GMM) works to eliminate the serial correlation, eliminate heteroskedasticity and covers Endogeniety Problems. Further, s efficient when we have less time periods and more cross sections (i.e., T <N).

Variable Definition

Dependent Variables

Indicators of risk considered were downside deviation and Standard deviation of ROA and downside deviation of ROE and Standard deviation.

Down side deviation is a variation of standard deviation that focuses only upon the "bad" volatility (Informa Investment Solution, 2016). Downside deviation ignores all of the "good" observations and instead focuses on the "bad" observation. Any negative return could be set as a "bad" observation. Alternatively, one could set the breakpoint as falling short of the risk-free rate. Another variation would be to consider any return that is less than the long-term average to be "bad" . The global idea behind downside risk is that the left hand side of a return distribution involves risk while the right hand side contains the better investment opportunities (Grootveld & Hallerbach, 1999).

Downside deviations were the fundamental factors to be considered for the risk since they talk about safety first suggested by Roy (1952). In many other studies volatility of ROA and volatility of ROE measured by standard deviation were used to measure the banks' risk. Hence, we have included them as well. Downside deviation is also popular as Sortino ratio which considers the returns below minimum average return (MAR). In the study, we have computed the overall volatility of returns together with volatility when returns are below average returns. Even Nobel laureate Harry Markowitz recognized downside deviation to measure risk is more appropriate than using standard deviation (Rollinger & Hoffman, 2013).

Independent Variables

In terms of independent variables, all six components used in supervision (i.e., CAMELS) were considered.

Capital adequacy. The first component 'C' stands for Capital adequacy and adequate capital is the fundamental for managing risk. Capital adequacy refers to a measure of a bank's ability to meet its obligations relative to its exposure to risk.

Capital adequacy ratio is the ratio which protects banks against excess leverage, insolvency and keeps them out of difficulty (Fatima, 2014). It is calculated as:

CAR = (Tier 1 Capital + Tier 2 Capital) / Risk-weighted assets.

Recent decision of NRB about increased paid up capital requirements from 2 billion to 8 billion provides substantial concern on risk management since higher capital reduces the chance of bank failure. As the data considered captures the entire period of BASEL II implementation along with later years of BASEL I, a dummy to capture impact of BASEL II was used as the proxy of capital adequacy.

The second component 'A' stands for Assets Quality and quality of assets held by banks determines their performance as well as risk management capacity. As loans have the highest default risk, an increasing number of non-performing loans shows a deterioration of asset quality. In this study, this parameter is measured by the provision for loan loss reserve to total asset ratio. This ratio assures to cover the bad and doubtful loans of the bank.

NRB has issued a directive to reduce non-performing loan and put provision for the same. Besides, recent liquidity crunch has also forced NRB to direct banks for concentration on quality assets and reduction on non-performing loans such as real-estate loan, auto loan, margin loan etc.

Management efficiency. The third component 'M' stands for Management Efficiency and banks being able to reduce their operating expense and increase earnings per employee providing diversified services to customers. The management acts as a safeguard to operate the bank in a smooth and decent manner and is called excellence management or skillful management, whenever it controls its cost and increases productivity, ultimately achieving higher profits . Management efficiency signifies adherence with prescribed norms, capability to counter to changing

environment, leadership, and administrative capability of the bank (Aspal &Dhawan, 2014). There is no unanimous among the studies in calculation of management efficiency. Studies use the following ratios are required to assess management efficiency: total advances to total deposits, business per employee, and return on advances.

The fourth component Earning Performance 'E' is explained using the relationship of net profit margin and net interest income to total assets. Earning quality expresses the quality of profitability and capability of a bank to sustain quality and earning consistently (Dechow & Schrand, 2004). It primarily reflects the profitability of bank and enlightens consistency of future earnings. Different studies have used different ratios, such as, operating profit to total assets, net interest margin to total assets, interest income to total income.

Recent financial crisis has proven that banks' deviation from core banking reduces their interest income and increases riskiness. Hence, earning performance and risk relation becomes an integral part of the study.

Liquidity. The fifth component 'L' stands for Liquidity and inability of banks to maintain sufficient liquidity which has been the main cause for 2007-2009 crisis. Liquidity means the ability of the bank to honor its obligations toward depositors. It also denotes the fund available with bank to meet its credit demand and cash flow requirements (Myers and Rajan, 1998). The following ratios are required to assess the liquidity: liquid assets to total asset, liquid assets to demand deposits, and credit deposit ratio(Aspal &Dhawan, 2016).

Hence, we exploit this opportunity to explore the impact of liquidity maintained by banks in their risk reduction. Rudolf (2009) emphasizes that "the

liquidity expresses the degree to which a bank is capable of fulfilling its respective obligations" (as cited in Dang, 2011).

The sixth and final component 'S' stands for Sensitivity to Market risk; which is measured by weighted average interest spread and the ratio of exchange gain (loss) to net gain (loss). Sensitivity to market risk shows exposure of the bank assets to the risk associated with its investment in the marketable securities. Grater the marketable securities on the bank's asset list, the grater will be the risk to the bank (Babar & Zeb, 2011). Studies use price earnings ratio, total securities to total assets ratio, and Gap analysis to measure sensitivity.

Due to its complexity for identification, most of the studies have not considered them. However, using the above mentioned proxies, this study tries to explore the relationship between sensitivity to market risk to risk reduction. In addition the circular issued by NRB in 2010 instructed commercial banks to maintain the spread less than or, up to 5% per annum and 4.5% in 2018. Hence, sensitivity is considered as a contributor for riskiness of banks.

Other Variables (Macroeconomic Factors and Ownership Dummies)

We also control for contribution made by macroeconomic factors, (Klomp & De Haan, 2011; Bouheni, 2013). The first variable we control is GDP growth rate which must have positive contribution in whole economy, banking performance and risk reduction. As GDP increases, the bank's level of business can be expected to increase, which in turn leads to better earnings and returns. Heffernan and Fu (2008); Sufian and Chong (2008) have also found a similar relationship. Sufian and Chong (2008) concurred that the positive relationship supports the argument of association between economic growth and performance of the financial sector.

The second control variable used is the rate of inflation. High inflation rates may increase the loan rate leading to higher income and risk reduction. Sufian and Chong (2008) claim that the inflation affects both their cost and revenue. They have found a positive relationship of inflation with ROA and ROE. According to Perry (1992), when the level of inflation is anticipated by banks, the interest rates are adjusted accordingly, thereby causing revenues to increase faster than costs and to subsequently positively impact bank profitability (as cited in Sufian, 2010). However, during liquidity crunch deposit rate may increase more than the loan rate and increase the risk to banks.

We also include the dummies since banks considered in the study have different structure of ownership such as government banks, joint venture banks and private banks. Shehzad, de Haan, and Scholtens (2010) have found that ownership concentration significantly affects loan quality and bank capitalization. Although supervision parameters used for all types of banks are same, focus of management, their loan and deposit structure may have been different due to ownership structure. We have assigned '1' if the bank is private or, Joint venture and zero when it is not.

In addition to above dummies, BASEL II dummy has been added to check the impact of capital adequacy on risk management. Central bank has implemented BASEL II and phased out the BASEL I since July, 2008 as earlier capital requirements was only to manage for liquidity whereas BASEL II requirements considered for operational and market risk too. In the year of BASEL I, the value of dummy is zero whereas BASEL II period, it is assigned '1'.

Data Analysis and the Model

With the data gathered from secondary source, the following model was used to analyze the risk management of commercial banks in Nepal. Since risk

management may be a function of both bank-specific characteristics and market characteristics that are exogenous to the bank (Forster & Shaffer, 2005). To test the effect of CAMELS variables on the risk management of banks, Arellano-Bover / Blundell-Bond Estimation was employed and a robust standard error were used in the panel data. The supervision impact was measured using CAELS components for off-site supervision and 'M' management efficiency components for on-site supervision. Macroeconomic factors: GDP growth rate and inflation rate controls the impact of economic activities on banks' performance and risks. Further comparative analysis among government owned, joint venture and local private banks was performed by adding dummies.

The First Model

$$RM_{i,t} = \beta o + \beta 1\, RM_{i,t-1} + \beta 2\, C1_{i,t} + \beta 3\, C2_{i,t} + \beta 4\, A1_{i,t} + \beta 5\, A2_{i,t} + \beta 6\, M1_{i,t} + \beta 7\, E1_{i,t} + \beta 8\, E2_{i,t} + \beta 9\, L1_{i,t} + \beta 10\, L2_{i,t} + \beta 11\, S1_{i,t} + \beta 12\, S2_{i,t} + \beta 13\, GDP_{i,t} + \beta 14\, INF_{i,t} + \beta 15\, PVTDUMMY_{i,t} + \beta 16\, JVDUMMY_{i,t} + \beta 17\, B2 + \varepsilon_{i,t} \quad \text{..... I}$$

The Second Model

$$RM_{i,t} = \beta o + \beta 1\, RM_{i,t-1} + \beta 2\, A1_{i,t} + \beta 3\, A2_{i,t} + \beta 4\, M1_{i,t} + \beta 5\, E1_{i,t} + \beta 6\, E2_{i,t} + \beta 7\, L1_{i,t} + \beta 8\, L2_{i,t} + \beta 9\, S1_{i,t} + \beta 10\, S2_{i,t} + \beta 11\, GDP_{i,t} + \beta 12\, INF_{i,t} + \beta 13\, PVTDUMMY_{i,t} + \beta 14\, JVDUMMY_{i,t} + \beta 15\, DUMCA + \varepsilon_{i,t} \quad \text{..... II}$$

Where,

'RM' indicates the Risk management (i.e., Downside Deviation of ROA, Downside deviation of ROE, Standard Deviation of ROA and Standard Deviation of ROE). The subscripts 'i' is used to denote the i^{th} bank and't' is the time from 2004 to 2015. One year lag is used in the Risk Management as an instrument variable (IV) to solve the Endogeniety issues; problem of omitted variable and simultaneity issues. Beta coefficients measure the magnitude of impact of selected variables to the dependent

variable. CAMELS are the combination of off-site supervision tools CAELS and 'M' as a proxy of on-site supervision. To control the impact of macroeconomic factors, GDP growth rate and inflation rates are used in the panel. Dummies have been used to compare the performance of Joint venture commercial banks with government owned banks and private commercial banks with the government banks.

In the second model, impact of increased capital base with BASEL II implementation will be measured using the final dummy variable. The dummy variable substitutes the capital adequacy ratios used in the first model as it works as proxy to CAR.

Finally 'ε' is used to show the remaining error not captured by idiosyncratic variables in the proposed model.

Diagnostics Tests and Robustness of the Model

The following diagnostics test were performed for the robustness of the model: pvarsoc test for lag order selection, Hensen J (1982) test for the validation of over identification restriction, Wald test for validation of every single variable used in the model and Autoregressive AR (2) in first differences which detects autocorrelation in terms of levels.

In any of the dynamic panel data analysis, we need to justify the rationale behind lag order selection. Panel vector autoregressive lag order selection condition (PVARSOC) command is used to select the lag order condition in panel (Abrigo & Love, 2015). For all four dependent variables (i.e., Downside and standard deviation of ROA and ROE) pvarsoc test result is as below:

Table 1

Panel Var for Lag Order Selection

Lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	.9996231	46.31318	.4178976	-147.9738	-43.68682	-85.32746
2	.9968299	35.20354	.5062831	-120.226	-36.79646	-70.10897
3	.9980251	25.12423	.5674999	-91.44795	-28.87577	-53.86015
4	.9997292	20.3056	.3158799	-57.40918	-15.6944	-32.35065
5	.9998944	13.77903	.1304056	-25.07836	-4.220971	-12.5491
6	.9931349					

Since the lowest value for Modified Akaike Information Criteria (MAIC), Modified-Bayesian Information Criteria (MBIC) and Modified-Quasi Information Criteria (MQIC) is lowest for lag 1 , model with lag1 is considered best (Raftery, 1995). Hence, first lag was used in our model for the analysis.

According to Cameron and Trivedi (2010), Hansen J test is superior to Sargan test for the validation of over identification restriction. The Wald Chi Squared test is also performed to find if explanatory variables in the models is affecting in a meaningful way.

Finally, the test for AR (2) in first differences was tested which detects autocorrelation in levels. Rejecting the null hypothesis of no serial correlation in the first-differenced errors at an order greater than one implies model misspecification (Mileva, 2007).

CHAPTER IV

RESULTS

This chapter aims to present the outcomes from the proposed methods and relationships of the variables of interest. This section analyzes and interprets the result of the empirical research.

Descriptive Statistics

Descriptive statistics gives the summary of the variables used for this study. It is a form of univariate analysis which shows the number of observations, mean, standard deviation, minimum and maximum values of the variables.

Table 2

Descriptive Statistics of Supervision Measured by CAMELS on Risk Measures

Variable	Mean	Std. Dev.	Min	Max
Down Side Deviation of ROA	0.0026	0.0062	0	0.0687
Downside Deviation of ROE	0.0097	0.0469	0	0.6174
Standard Deviation of ROA	0.0059	0.0153	0.0001	0.1577
Standard Deviation of ROE	0.0496	0.0984	0.0001	0.6669
Core Capital to Risk Weighted Assets	0.1296	0.6516	-0.5625	11.28
Capital Fund to Risk Weighted Assets	0.1030	0.1192	-0.5554	0.4164
Non-Performing Loan to Total Loan	0.0507	0.0887	0.0001	0.5764
Loan Loss Reserve to Total Loans and Advances	0.0177	0.0368	0	0.3408
Operating Expenses Ratio	0.2450	0.1179	0.0879	0.995
Net Profit Margin	0.1672	0.2748	-2.1496	1.3619
Net Interest Income to Total Assets	0.0324	0.0105	0.0035	0.0790
Liquid Assets to Total Deposits	0.3304	0.2721	0.0557	3.8031
Credit to Deposit Ratio	0.7824	0.1568	0.3163	1.3046
Exchange Gain (Loss) to Net Gain (Loss)	0.3012	1.2751	-0.7541	21.2486
Weighted Average Interest Spread	0.0406	0.0090	0.021	0.0775
GDP Growth Rate	0.1302	0.0373	0.0904	0.2198
Inflation	0.0794	0.0234	0.04	0.126

The mean of downside deviation of ROA is 0.0016 with minimum of 0 and maximum of 0.0687 whereas the mean of downside deviation of ROE is 0.0097 with minimum of 0 and maximum of 0.6174. Similarly, the mean of standard deviation of ROA is 0.0056 with a minimum of 0.0001 and maximum of 0.1577 whereas the mean of standard deviation of ROE is 0.0496 with a minimum of 0.0001 and maximum of 0.6669.

The minimum values of capital adequacy ratios (i.e., Core Capital to Risk Weighted Assets and Capital Fund to Risk Weighted Assets) are negative due to negative net worth of all three government owned banks plus three other category banks. The minimum value of net profit margin is also negative due to net losses faced by many banks especially during liquidity crunch of 2007-2008 and during their initial year of operations. Those banks facing losses were merged already except for the government owned banks. Finally, the ratio of Exchange Gain (Loss) to Net Gain (Loss) is also negative due to exchange losses faced by most of the banks so far.

The mean value and standard deviation of both the standard and downside deviation of ROE are greater than the standard and downside deviation of ROA tells that banks are levered firms and exposed to financial risk. Hence, equity shareholders face more risk for higher returns than that of average assets due to their capital structure and leverages.

Correlation Analysis

Pearson Correlation Analysis used to analyze nature and strength of relationship among the variables. The below table provides a simple correlation matrix. This shows that almost all dependent variables are negatively correlated with Risk indicators.

Table 3

Correlation Matrix of Supervision Measured by CAMELS on Risk Measures

	Down Side Deviation of ROA	Down Side Deviation of ROE	Standard Deviation of ROA	Standard Deviation of ROE	Core Capital to Risk Weighted Assets	Capital Fund to Risk Weighted Assets	Non-Performing Loan to Total Loan	Loan Loss Reserve to Total Loans and Advances	Operating Expenses Ratio	Net Profit Margin	Net Interest Income to Total Assets	Liquid Assets to Total Deposits	Credit to Deposit Ratio	Exchange Gain(Loss) to Net Gain (Loss)	Weighted Average Interest Spread	GDP Growth Rate	Inflation	DUM1JV	DUM2PVT	DUMCA
Down Side Deviation of ROA	1																			
Down Side Deviation of ROE	0.09	1.00																		
Standard Deviation of ROA	0.40	0.21	1.00																	
Standard Deviation of ROE	0.12	0.31	0.49	1.00																
Core Capital to Risk Weighted Assets	-0.03	-0.03	-0.07	-0.05	1.00															
Capital Fund to Risk Weighted Assets	-0.21	-0.14	-0.28	-0.19	0.17	1.00														
Non-Performing Loan to Total Loan	0.36	0.24	0.49	0.46	-0.13	-0.66	1.00													
Loan Loss Reserve to Total Loans and Advances	0.52	0.15	0.53	0.38	-0.07	-0.32	0.64	1.00												
Operating Expenses Ratio	0.09	0.12	0.07	0.16	-0.09	-0.54	0.36	0.11	1.00											
Net Profit Margin	-0.60	-0.11	-0.38	-0.24	0.01	0.09	-0.23	-0.73	0.06	1.00										
Net Interest Income to Total Assets	-0.06	0.07	0.06	0.29	-0.04	-0.10	0.26	0.20	0.27	0.20	1.00									
Liquid Assets to Total Deposits	-0.03	0.01	0.02	0.05	-0.01	0.07	0.00	-0.01	0.06	0.07	-0.16	1.00								
Credit to Deposit Ratio	0.03	0.03	0.07	0.19	0.12	0.42	-0.06	0.17	-0.36	-0.22	0.22	-0.01	1.00							
Exchange Gain (Loss) to Net Gain (Loss)	-0.07	-0.04	-0.14	-0.17	0.03	0.13	-0.20	-0.13	-0.07	0.04	-0.16	-0.05	-0.03	1.00						
Weighted Average Interest Spread	-0.12	0.06	-0.09	0.09	-0.01	-0.27	0.16	-0.02	0.47	0.23	0.52	-0.08	-0.14	-0.16	1.00					
GDP Growth Rate	-0.10	-0.02	-0.09	-0.10	-0.03	0.07	-0.16	-0.13	-0.05	0.10	0.08	0.00	0.02	0.02	-0.01	1.00				
Inflation	-0.12	-0.01	-0.14	-0.09	0.00	0.12	-0.24	-0.12	-0.08	0.06	0.03	0.00	0.02	0.03	0.08	0.49	1.00			
DUM1JV	0.04	-0.06	-0.02	-0.11	-0.04	0.05	-0.07	0.00	-0.09	0.14	0.16	0.01	-0.36	0.04	0.05	-0.02	-0.07	1.00		
DUM2PVT	-0.05	-0.05	0.03	-0.01	0.11	0.32	-0.20	-0.03	-0.44	-0.22	-0.35	-0.03	0.52	0.07	-0.36	0.00	0.08	-0.79	1.00	
DUMCA	-0.24	-0.05	-0.24	-0.15	-0.06	0.24	-0.34	-0.20	-0.18	0.06	-0.05	-0.07	0.01	0.04	0.13	0.39	0.70	-0.12	0.17	1

The above table shows the correlation covariance matrix for all the variables considered for the study. The main purpose it served was to check for the potential collinearity issues. Since the correlation coefficient between most of the variables are either negative or, very low positive. Hence, the variables chosen for the study based on theory are consistent with the data. The only variable having higher positive correlation is loan loss reserve to loans and advances with both the downside and standard deviation of ROA and non-performing loan to total loan with coefficient 0.52, 0.53 and 0.64 respectively.

Moreover, the model considered for the study being system GMM with panel data would automatically remove the variables with multicollinearity issues if in case existed while regressing.

Regression Results

Downside Deviation of ROA

The downside deviation of ROA has been tested using two different models (i.e., first model with capital adequacy ratios without Basel II dummy and the second one with Basel II dummy replacing the capital adequacy ratios) and the results are presented in Table 4. Three diagnostics measures carried here are Wald test, AR (2) test and the Hansen J test.

The Hansen J test is carried out to check the validity of over identification restrictions. Here, null hypothesis could not be rejected, which implied that the over identification restrictions were valid and model considered was appropriate for the study.

Finally, AR (2) test was performed to detect the autocorrelation. Since null hypothesis of no serial correlation in the first-differenced errors could not be rejected, this explained that the model was correctly specified.

Table 4

Effect of Supervision (CAMELS) on Risk Measured by Downside Deviation of ROA

Down Side Deviation of ROA	Without BASEL2 DUMMY		Without CA Proxies	
	Coef.	P>z	Coef.	P>z
Down Side Deviation of ROA L1	0.281	0***	0.258	0***
Core Capital to Risk Weighted Assets	-0.001	0.931	N/A	N/A
Capital Fund to Risk Weighted Assets	0.003	0.637	N/A	N/A
Non-Performing Loan to Total Loan	0.036	0***	0.034	0***
Loan Loss Reserve to Total Loans and Advances	-0.061	0.01** *	-0.064	0.006*
Operating Expenses Ratio	0.015	0.116	0.016	0.082
Net Profit Margin	-0.020	0***	-0.020	0***
Net Interest Income to Total Assets	-0.050	0.502	-0.046	0.529
Liquid Assets to Total Deposits	0.001	0.875	0.001	0.963
Credit to Deposit Ratio	-0.003	0.646	-0.002	0.72
Exchange Gain(Loss) to Net Gain (Loss)	-0.001	0.751	-0.001	0.65
Weighted Average Interest Spread	-0.103	0.118	-0.098	0.134
GDP Growth Rate	-0.005	0.611	-0.003	0.759
Inflation	0.036	0.069*	0.046	0.046* *
DUM1JV	0.011	0.115	0.012	0.069*
DUM2PVT	0.002	0.815	0.003	0.64
DUMCA	N/A	N/A	-0.002	0.355
cons	0.002	0.832	0.000	0.965
Wald Test for Significance of Variables in the Model				
Wald chi2(17) =	552.48		564.56	
Prob > chi2 =	0.0000***		0.0000***	
Hansen Test of Over identifying Restrictions				
chi2(10) =	10.09		10.27	
Prob > chi2 =	0.433***		0.417***	
Arellano-Bond test for detecting autocorrelation in level				
AR (1) in first differences:	z = -1.90	Pr > z = 0.058	z = -1.96	Pr > z = 0.049
AR (2) in first differences:	z= -1.45	Pr > z = 0.148	z = -1.38	Pr > z = 0.167

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

The above table summarizes the results based on two different models. In the first model, all the independent variables as per the conceptual frameworks have been

used along with macroeconomic variables and dummies of ownership structure for comparison of joint venture and local private banks with the government banks.

In the second model, only the capital adequacy dummy is used with the elimination of capital adequacy ratios put in the first and second model. The motivation is to check the impact of increased capital requirements during the implementation of BASEL II.

The model being system GMM in the dynamic panel data, lag variable has been used in all the models to express the impact of earlier period of same dependent variable.

As per the priori, past period's Downside deviation of ROA has the capacity to predict the current year's Downside deviation of ROA. The result in the table validates the priori with all significant p values at 1% significance level.

In the first model, the proxies of capital adequacy are insignificant tells that the Downside deviation of ROA of commercial banks in Nepal cannot simply be reduced by the higher amount of capital. However, the coefficient of Core Capital to Risk Weighted Assets is negative. This result have been further validated by the capital adequacy dummy captured by BASEL II with their negative coefficient with p value insignificant.

To conclude, in case of Nepalese commercial banks, the downside deviation of ROA cannot be reduced by simply increasing the amount of capital. The increased capital may further bring the risk of reinvestment and return reduction.

The second measure considered is the quality of assets measured by NPL to total loan and LLR to total loans and advances. The first variable Non-Performing Loan to Total Loan is highly significant at 1% level of significance with zero p value. It tells that the commercial banks in Nepal can reduce their downside deviation of

ROA by reducing the NPL. Here, 1% reduction in NPL by the banks can reduce its downside deviation of ROA by 3.63% as captured by first model. It confirms the efforts and initiatives taken by central banks to supervise commercial banks are effective enough to help them in reducing their risk of assets. The second variable LLR to total loans and advances with p value significant also confirms the results as: 1% provisioning of LLR will reduce their downside deviation of ROA by 6% on an average as measured by the negative coefficient of both models.

The third variable of interest is onsite supervision parameter "management efficiency' as captured by operating expenses ratio is also significant at 10% in the second model with slightly insignificant in the first one. In the second one, the dummy variable used to check the BASEL II capital contribution has been removed. The beta coefficient tells that the efficiency of management to reduce their cost by 1% will help reducing the riskiness by 1.5% on an average.

The fourth variable of interest is the impact of earning efficiency on risk reduction. Out of the two proxies used, one is found to be significant. If the commercial banks in Nepal are capable enough to increase their Net Profit Margin, the downside deviation of ROA will decline with certainty as captured by the zero p value in both models. The beta coefficient tells that 1% increase in Net Profit Margin will help reducing the riskiness of banks measured by downside deviation of ROA by 2% on an average.

Two of the variables of our interest are liquidity and sensitivity to market risk is found to be insignificant as shown by the results in both models.

The GDP growth rate considered here is found to be insignificant. The other macroeconomic variable inflation is found to be significant in all three models with p

value less than 0.05 in the second model and p value less than 0.1 in the first one. It causes 4.8% change in downside deviation of ROA due to 1% change on inflation.

In addition, the joint venture dummy is significant at 10%. It tells that the riskiness of bank varies due to ownership structure. On the other hand, insignificant p values of local private banks dummy gives the mixed results. The final dummy added to check the impact of capital adequacy during BASEL II implementation has no contribution. BASEL

Downside Deviation of ROE

The downside deviation of ROE has been tested using two different models (i.e., first model with capital adequacy ratios without Basel II dummy and the second one with Basel II dummy replacing the capital adequacy ratios) and the results are presented in Table 5. Three diagnostics measures carried here are Wald test, AR (2) test and the Hansen J test

The Hansen J test is carried out to check the validity of over identification restrictions. Here, null hypothesis cannot be rejected. It explains that the over identification restrictions are valid.

Finally, AR (2) test was performed to detect the autocorrelation. Since null hypothesis of no serial correlation in the first-differenced errors cannot be rejected explained that the model is correctly specified.

Table 5

Effect of Supervision (CAMELS) on Risk Measured by Downside Deviation of ROE

Down Side Deviation of ROE	Without BASEL2 DUMMY		Without CA Proxies	
	Coef.	P>z	Coef.	P>z
Down Side Deviation of ROE L1	0.008	0.899	0.006	0.929
Core Capital to Risk Weighted Assets	0.000	0.967	N/A	N/A
Capital Fund to Risk Weighted Assets	-0.075	0.229	N/A	N/A
Non-Performing Loan to Total Loan	0.124	0.268	0.199	0.096*
Loan Loss Reserve to Total Loans and Advances	-0.019	0.939	-0.291	0.276
Operating Expenses Ratio	0.103	0.318	0.226	0.047**
Net Profit Margin	-0.004	0.883	-0.017	0.561
Net Interest Income to Total Assets	-0.703	0.367	-0.312	0.716
Liquid Assets to Total Deposits	0.024	0.273	0.029	0.24
Credit to Deposit Ratio	-0.101	0.1*	-0.139	0.033**
Exchange Gain(Loss) to Net Gain (Loss)	-0.001	0.915	-0.002	0.903
Weighted Average Interest Spread	-0.907	0.155	-0.917	0.209
GDP Growth Rate	0.146	0.19	0.202	0.112
Inflation	-0.078	0.714	0.329	0.239
DUM1JV	0.003	0.951	0.010	0.872
DUM2PVT	0.007	0.872	0.049	0.329
DUMCA	N/A	N/A	-0.028	0.099*
_cons	0.104	0.151	0.039	0.629
Wald Test for Significance of Variables in the Model				
Wald chi2(17) =	25.38		28.77	
Prob > chi2 =	0.063*		0.017**	
Hansen Test of Over identifying Restrictions				
chi2(10) =	8.5		13.94	
Prob > chi2 =	.581		.176	
Arellano-Bond test for detecting autocorrelation in level				
AR (1) in first differences:	z = -1.43	Pr > z = 0.153	z = -1.88	Pr > z = 0.061
AR (2) in first differences:	z= -1.04	Pr > z = 0.300	z = -1.82	Pr > z = 0.069

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

The variables of capital adequacy are found to be insignificant in the first model as explained by the p values.. In the second model, when capital adequacy ratios are replaced with the BASELII dummy, the dummy is found to be significant at

10%. Hence, the increased capital base has the potential to reduce their riskiness as captured by the coefficient of dummy. The result shows that 1% increase in the capital reduces downside deviation by 2.83% on an average.

The above results show that the liquidity maintained by commercial banks reduces the downside deviation of equity as captured by coefficient on CD ratio. The p values are significant in both models with 10.11% and 13.93% reduction in downside deviation of ROE due to 1% increase in CD ratio.

In the first model, no other variables except for the CD ratio are found to be significant whereas CAML variables are found to be significant in the second model. The assets quality measured by Non-Performing Loan to Total Loan is significant at 10% with the coefficient of 0.1991.

The management efficiency as measured by a proxy operating ratio is found to be significant in the second model at 5%. The beta coefficient 0.2261 means that the reduction in 1% operating expenses to total operating revenue will bring 22.61% decline in downside deviation of ROE.

Remaining variables are insignificant. Macroeconomic variables, GDP growth rate and inflation are found to be insignificant. In addition, the joint venture and private local bank dummy are also insignificant.

There seems a major difference in outcomes compared with downside deviation of ROA. The reason here is supervisory authority are primarily concerned towards the risk reduction in assets than that of protecting equity shareholder. In any case, central bank's goal is to protect the interest of savers, depositors and creditors by helping banks maintain good quality of assets or, stronger capital base or sufficient equity etc. but not to concentrate in the interest of investors. Hence, the findings based on data along with comparative study are important.

Standard Deviation of ROA

The standard deviation of ROA has been tested using two different models (i.e., first model with capital adequacy ratios without Basel II dummy and the second one with Basel II dummy replacing the capital adequacy ratios) and the results are presented in table 6. Three diagnostics measures carried here are Wald test, AR (2) test and the Hansen J test.

The Hansen J test is carried out to check the validity of over identification restrictions. Here, null hypothesis cannot be rejected. It explains that the over identification restrictions are valid and model considered is appropriate for the study.

Finally, AR (2) test was performed to detect the autocorrelation. Since null hypothesis of no serial correlation in the first-differenced errors cannot be rejected explained that the model is correctly specified.

Table 6

Effect of Supervision (CAMELS) on Risk Measured by Standard Deviation of ROA

Standard Deviation of ROA	Without BASEL2 DUMMY		Without CA Proxies	
	Coef.	P>z	Coef.	P>z
Standard Deviation of ROA L1	0.017	0.786	-0.027	0.644
Core Capital to Risk Weighted Assets	-0.000	0.858	N/A	N/A
Capital Fund to Risk Weighted Assets	-0.035	0.028**	N/A	N/A
Non-Performing Loan to Total Loan	0.131	0***	0.130	0***
Loan Loss Reserve to Total Loans and Advances	-0.066	0.326	-0.067	0.006*
Operating Expenses Ratio	0.029	0.295	0.018	0.082*
Net Profit Margin	-0.009	0.192	-0.009	0***
Net Interest Income to Total Assets	-0.079	0.695	-0.247	0.529
Liquid Assets to Total Deposits	-0.018	0.169	-0.026	0.963
Credit to Deposit Ratio	-0.046	0.017**	-0.038	0.72
Exchange Gain(Loss) to Net Gain (Loss)	0.001	0.764	0.002	0.65
Weighted Average Interest Spread	-0.317	0.07*	-0.120	0.134
GDP Growth Rate	-0.006	0.832	0.021	0.759
Inflation	-0.057	0.345	0.121	0.046**
DUM1JV	0.122	0***	0.142	0.069*
DUM2PVT	0.089	0***	0.109	0.64
DUMCA	N/A	N/A	-0.020	0.355
_cons	-0.027	0.334	-0.054	0.965
Wald Test for Significance of Variables in the Model				
Wald chi2(17) =	191.14		229.61	
Prob > chi2 =	0.000***		0.000***	
Hansen Test of Over identifying Restrictions				
H0: Over identifying Restrictions are Valid				
chi2(10) =	16.69		15.77	
Prob > chi2 =	0.082***		0.106***	
Arellano-Bond test for detecting autoeorrelation in level				
AR (1) in first differences:	z = -1.75	Pr > z = 0.081	z = -1.65	Pr > z = 0.098
AR (2) in first differences:	z= -1.68	Pr > z = 0.093	z = -1.54	Pr > z = 0.125

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

The above result shows capital adequacy to be significant for volatility reduction with the p value of 0.028 and negative beta coefficient of -0.035 as measured by Capital Fund to Risk Weighted Assets. It means 1% increase in Capital Fund to Risk Weighted Assets causes 3.5% decrease in standard deviation of ROA. On the contrary, it does not seem to be significant with Core Capital to Risk Weighted Assets. However, negative beta coefficient makes it clear about the importance of capital adequacy for reduction of standard deviation of ROA which is consistent with the results of BASEL II implementation dummy in the second model.

The assets quality matters for risk reduction as measured by NPL to Total loan in both the models. Higher the Non-Performing Loan to Total Loan, higher will be the standard deviation of ROA. Hence, banks should put serious efforts to reduce their non-performing loans. Here, it is significant at 1% with p value zero in both the models and beta coefficient of 0.131 and 0.130 respectively. It means, 1% increase in Non-Performing Loan to Total Loan causes more than 13% increase in their standard deviation of ROA. Similarly, other proxy used for assets quality is Loan Loss Reserve to Total Loans and Advances, which is also significant in the second model at 1% with a negative beta coefficient of -0.067. It means, when banks increase their loan loss reserve to total loans and advances by 1%, their risk will decrease by 6.68% on average as measured by standard deviation of ROA. The coefficient is negative in the first model as well though p value is insignificant.

The third variable of interest management efficiency ratio as measured by operating expense ratio is also significant at 10% in the second model. The beta coefficient 0.018 indicates that 1% increase in operating expenses to total operating ratio causes 1.77% increase in riskiness of banks as measured by standard deviation of ROA. The positive coefficient in the first model though p value is insignificant also

validates that the banks' management which are efficient to reduce their operating expense can reduce their volatility of returns.

Out of the two variables used as the proxy for earning efficiency of banks, only first variable net profit margin is significant in the second model at 1% level of significance with beta coefficient of -0.009. It means, 1% increase in net profit margin has potential to decrease risk by 0.8% on average. However, it is found to be insignificant in the first model. In addition, Net Interest Income to Total Assets is insignificant with both the model tells that banks which are efficient at earning may not necessarily reduce their risks.

Liquidity of commercial banks as captured by Liquid Assets to Total Deposits and Credit to Deposit Ratio are found to be insignificant with an exception of CD ratio in the first model at 5% and coefficient -0.046. However, beta coefficient negative in both the models and with both proxies indicate that better liquidity facilitates in risk reduction of commercial banks in Nepal as captured by standard deviation of ROA.

One of the variables, weighted average interest spread is found to be significant at 10% level with a negative coefficient of -0.317 in the first model. It means, 1% increase in spread cause 31.67% decrease in variability of return. This result is very interesting as NRB has been concerned towards spreads reduction and it is not in favor of banks for variability reduction.

Both the macroeconomic variables are producing contradictory results as they have negative beta coefficient in the first model and positive in the second one. Here, inflation is found to be significant at 5% in the second model with beta coefficient of 0.121. It means, higher the inflation higher will be the variability of banks' return. To

be precise, 1% increase in inflation rate causes 12% increase in standard deviation of ROA.

Finally, the joint venture and local private dummies being significant tells that the ownership structure of banks really matter for the variation of their returns.

Standard Deviation of ROE

The standard deviation of ROE has been tested using two different models (i.e., first model with capital adequacy ratios without Basel II dummy and the second one with Basel II dummy replacing the capital adequacy ratios) and the results are presented in Table 7. The p value is significant at 1% for Wald statistic and implies significance of the model estimated.

The Hansen J test is carried out to check the validity of over identification restrictions. Here, null hypothesis cannot be rejected. It explains that the over identification restrictions are valid and model considered is appropriate for the study.

Finally, AR (2) test was performed to detect the autocorrelation. Since null hypothesis of no serial correlation in the first-differenced errors cannot be rejected explained that the model is correctly specified.

Table 7

Effect of Supervision (CAMELS) on Risk Measured by Standard Deviation of ROE

Standard Deviation of ROE	Without BASEL2 DUMMY		Without CA Proxies	
	Coef.	P>z	Coef.	P>z
Standard Deviation of ROE L1	0.426	0***	0.418	0***
Core Capital to Risk Weighted Assets	-0.002	0.779	N/A	N/A
Capital Fund to Risk Weighted Assets	0.009	0.917	N/A	N/A
Non-Performing Loan to Total Loan	0.827	0***	0.750	0***
Loan Loss Reserve to Total Loans and Advances	-1.288	0***	-1.312	0***
Operating Expenses Ratio	-0.067	0.617	-0.072	0.583
Net Profit Margin	-0.114	0.001***	-0.119	0***
Net Interest Income to Total Assets	1.702	0.128	1.809	0.105 *
Liquid Assets to Total Deposits	0.061	0.347	0.068	0.29
Credit to Deposit Ratio	-0.057	0.57	-0.044	0.658
Exchange Gain(Loss) to Net Gain (Loss)	-0.015	0.411	-0.013	0.455
Weighted Average Interest Spread	0.098	0.919	0.157	0.871
GDP Growth Rate	-0.142	0.341	-0.147	0.343
Inflation	0.121	0.708	0.188	0.633
DUM1JV	-0.070	0.273	-0.027	0.672
DUM2PVT	0.030	0.694	0.057	0.43
DUMCA	N/A	N/A	-0.010	0.739
_cons	0.029	0.802	-0.009	0.935
Wald Test for Significance of Variables in the Model				
Wald chi2(17) =	149.49		142.22	
Prob > chi2 =	0.000***		0.000***	
Hansen Test of Over identifying Restrictions				
chi2(10) =	9.51		10.88	
Prob > chi2 =	0.484***		0.367***	
Arellano-Bond test for detecting autocorrelation in level				
AR (1) in first differences:	z = -1.63	Pr > z = 0.103	z = -1.86	Pr > z = 0.063
AR (2) in first differences:	z= -1.10	Pr > z = 0.271	z = -1.03	Pr > z = 0.304

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

The above results show that the single lag variable used in the model is significant at 1% level although it is not necessary parameter for using the dynamic panel data.

Capital adequacies are found to be insignificant in both the model when standard deviation of ROE is considered for risk measurement. In first model, p values are insignificant for capital adequacy ratios and BASEL II dummy is also found to be insignificant in the second one. Hence, it can be interpreted that central bank is concerned towards assets of the banks while supervising and framing policies and not with the equity.

When assets qualities are considered, both the variables are highly significant under both models at 1% level of significance. Here, 1% increase in Non-Performing Loan to Total Loan may increase about 75% (based on second model) and 82.68% (based on first model) risk in return. Similarly, Loan Loss Reserve to Total Loans and Advances is highly significant with coefficient of -1.288 and -1.312 in model I and II respectively.

Another variable found to be significant here is earning efficiency. This result is consistent with the theory as earnings and equity have direct connection.

All remaining variables are found to be insignificant for risk reduction of commercial banks when measured with standard deviation of ROE.

CHAPTER V

SUMMARY, DISCUSSIONS, AND IMPLICATIONS

This chapter is divided into four sections comprising major findings based on data and methodology used, implications of the study, discussions over findings and previous literatures and critique of the study. In addition, possible contribution, contradiction, limitations and future scope are discussed.

Major Findings

This study is undertaken with the objective of examining the impact of banking supervision on Bank's risk management using CAMELS supervision parameters. For the purpose, we have mainly used secondary data. The relationship has been tested between dependent and independent variables where dependent variables include risk management parameters like downside deviation and standard deviation of ROA and ROE while independent variables includes all six components used in supervision (i.e., CAMELS includes Capital Adequacy, Assets Quality, Management Efficiency, Earning Performance, Liquidity and Sensitivity).

The relationship was tested under two approaches having two models. In first model, off-site supervision tools CAELS and 'M' as a proxy of on-site supervision relation to Risk management. To control the impact of macroeconomic factors, GDP growth rate and inflation rates are used in the panel. Dummies have been used to compare the performance of Joint venture commercial banks with government owned banks and private commercial banks with the government banks. In second model, impact of increased capital base with BASEL II implementation was measured using

the final dummy variable. The dummy variable substitutes the capital adequacy ratios used in the first model as it works as proxy to CAR.

The correlation covariance matrix in table number 3 shows that the correlation coefficient between most of the variables are either negative or, very low positive. Hence, the variables chosen for the study based on theory are consistent with the data, supporting the regression analysis.

In table number 4 the downside deviation of ROA has been tested using two different models. Out of all independent variables including CAMELS parameter and dummy variables, assets quality (measured by Non-Performing Loan to Total Loan and Provision for Loan Loss to Loans and Advances), management efficiency (measured by Operating Expense Ratio), Earning efficiency (out of two proxies only one proxy i.e. Net profit margin), inflation and joint venture dummy are found to have significant effect on downside deviation of ROA.

Other variables like Capital adequacy (measured by Core Capital to Risk Weighted Assets and Capital Fund to Risk Weighted Assets), liquidity (measured by Credit to Deposit Ratio and Liquid Assets to Total Deposit), Sensitivity (measured by Exchange Gain (Loss) to Net Profit (Loss) and Weighted Average Interest Spread) and GDP growth rate are found to have insignificant effect on downside deviation of ROA. However, despite having insignificant effect of liquidity and sensitivity to market risk, negative coefficient tells that the central bank's supervision under these two parameters reduces commercial banks' downside deviation of ROA. Similarly, in table 4 the negative coefficient tells that the increased growth of GDP will help banks to reduce their riskiness.

In table 5 the downside deviation of ROE has been tested using similar diagnostic tests. The result shows that the increased capital base of banks has the

potential to reduce their riskiness as captured by the coefficient of dummy as well as that of Capital Fund to Risk Weighted Assets ratio and liquidity.

In the first model, no other variables except for the CD ratio are found to be significant whereas CAML variables are found to be significant in the second model. Remaining variables have insignificant relation to downside deviation of ROE. Both the macroeconomic variables (GDP growth rate and inflation) and dummy variables (the joint venture and private local bank) are found to be insignificant. The difference in the outcome as compared to that of downside deviation of ROA shows that the focus of supervision is more on risk reduction in assets than that of safeguarding equity shareholder.

From the result in table 6, we found that riskiness of commercial banks as measured by standard deviation of ROA is significantly affected by capital adequacy (measured by Capital Fund to Risk Weighted Assets and BASEL II implementation dummy), assets quality (measured by Non-Performing Loan to Total Loan and Loan Loss Reserve to Total Loans and Advances), management efficiency (measured by operating expense ratio in second model), earning efficiency (measured by net profit margin in second model), liquidity (measured by CD ratio in the first model) and Sensitivity (measured by weighted average interest spread). Similarly, in case of macro-economic variables, inflation found to have significant effect in the model without CA proxies having the contradictory result of positive and negative coefficient in second and first models respectively. Finally, the joint venture and local private dummies being significant tells that the ownership structure of banks really matter for the variation of their returns.

The result of further test using standard deviation of ROE for risk measurement in table 7 shows that assets qualities measured by both the variables are

highly significant under both models at 1% level of significance. Similarly, earning efficiency is also found to have significant effect on risk reduction of commercial banks when measured with standard deviation of ROE. All remaining variables are found to be insignificant for risk reduction of commercial banks when measured with standard deviation of ROE.

In overall, the effects of independent variables (CAMELS parameters and other variables) were studied on four different risk measurement variables (downside deviation of ROA and ROE and Standard deviation of ROA and ROE). The result shows that assets quality has significant effect on risk reduction of Nepalese commercial bank and the result is consistent in case of all risk measurement variables. Hence, it can be interpreted that central bank is concerned towards assets of the banks while supervising and framing policies and not with the equity. Similarly, earning efficiency are also found to have significant effect on risk reduction of commercial banks when measured with risk measurement parameters. This result supports the theory that earnings and equity have direct connection.

Finally, it can be concluded that the supervision measured using CAMELS parameters have positive impact on risk management of commercial banks in Nepal as measured by downside and standard deviation of ROA and ROE respectively. Out of the six components under CAMELS, four are found to be significant contributor as the quality of assets, management efficiency, earning efficiency and liquidity whereas, capital adequacy and sensitivity to market risk are found not as a contributor for risk management. This finding satisfies the first hypothesis H1: Supervision positively affects the banks' risk management. Similarly, the second hypothesis H2: CAML parameters have stronger impact on risk management of commercial banks amongst total six variables (i.e., CAMELS) is found to be partially valid as the

contribution of capital adequacy was not observed as expected. In contrast, the earning efficiency has a significant contribution in risk management of commercial banks in Nepal.

As per the second objective of the study, following ranking can be done based on their contribution to risk management as measured by downside and standard deviation of ROA and ROE respectively:

1. Assets quality is found to be the most important contributor as it is found to be significant under all parameters using both models.
2. Management efficiency measured by operating expense ratio is the major contributor for risk management of commercial banks as it is significant in all cases except with standard deviation of ROE.
3. Earning efficiency of commercial banks comes at the third as one proxy among two is found to be highly significant in all cases except with the downside deviation of ROE.
4. Liquidity maintained by banks also contributes for risk reduction but contribution is lesser than that of assets quality, management efficiency and earning efficiency. One of the proxies to measure liquidity is significant contributor for reduction of downside deviation of ROE and standard deviation of ROA.

Discussion

Based on the findings from this study, causal relation between supervision and risk management has been established. This finding confirms the initiatives taken by central bank for banking supervision and risk management. The continual improvement in banking supervision, initiation for switching from compliance based supervision to risk based supervision seems a must do for banking risk management.

Further the gradual updates and improvement from BASEL committee and adoption of global norms and practices are vital for risk management of commercial banks in Nepal.

Sarker (2005) has scrutinized the CAMEL as an appropriate model for supervision of Islamic banks and findings of this study are to certain extent similar. Findings of this study is also consistent with the findings of Dang (2011) that the CAMEL is a useful tool to examine the safety and soundness of banks along with risk mitigation leading to bank failures. However, this study has identified only four (i.e., AMEL) variable out of the six CAMELS parameters as the contributor for risk management.

Using the finalized models based on various literatures reviewed positive impact of supervision on risk Management of banks as measured by downside and standard deviation of ROA and ROE are confirmed. Hays, Stephen, and Arthur (2009) have found mixed results of CAMELS apart from sensitivity to market risk as statistically insignificant. This study has also produced similar results that the sensitivity to market risk is statistically insignificant with all four dependent variables under both models.

Gale (2010) has highlighted that the bank capital provides owners and managers with incentives to take lesser risk. However, finding of this study under both models are not in favor of adequate capital to risk management of commercial banks in context of Nepal. These results can be interpreted as insufficient capital increases the danger of banking failures whereas excess capital may eat up profit and produce risk through its added cost of capital. Gale (2010) has further added that the adequate capital avoids the situation of 'fire sale' of assets causing losses hence; capital adequacy is identified as major contributor for risk management of banks. In

contrary, findings of this study disagrees maybe due to sufficient capital maintained by all commercial banks in Nepal beforehand the capital requirement regulations by NRB and BASELS. In this study, capital adequacy ratios along with BASEL II dummy are found to be statistically insignificant.

Results of this study is somehow consistent with the findings of Blum (1999) as minimum capital requirements may not actually reduce the risk taking incentives of banks. Moreover, it is consistent with the findings of Barth et al. (2010) that the capital stringency is not statistically significant with bank performance and stability.

Another very important factor considered for banks' performance, stability and risk management is quality of assets. Abata (2014) has stated the assets quality as the fundamental factor in banking. Findings of this study fully supports the argument of Abata that the assets quality plays vital role in performance and risk management of banks. This study has found assets quality as the most important factor for risk management of commercial banks in Nepal as it is significant under both models and with all dependent variables.

Aftab, Samad, and Husain (2015) have offered interesting results after controlling GDP growth as: assets quality are important and positive contribution for risk management whereas capital adequacy and liquidity as the negative contributor. This study fully agrees that the assets quality positively contribute for risk management. However, contribution of capital adequacy are unidentified and liquidity as significant and positive contributor. Further, it supports the findings of Arvin and Ghoshray (2015) that the liquidity status of banks plays crucial role in performance of commercial banks in Nepal.

Grier (2007) opined that the earning efficiency build public confidence and contributes positively for enhancement of bank performance. This study adds to the

opinion with statistical significant relationship between earning efficiency and risk management of commercial banks in Nepal with various regression analyses.

Klomp and De Haan (2011) and Bouheni (2013) have opined that the GDP growth rate must have positive contribution in whole economy, banking performance and risk reduction as GDP increases, the bank's level of business can be expected to increase, which in turn leads to better earnings and returns. However, findings of this study is inconsistent with their findings. Both the controlled macroeconomic variables GDP growth rate and inflation rates are found to be statistically insignificant in case of Nepal. Sufian and Chong (2008) have claimed that the inflation affects both their cost and revenue and found a positive relationship of inflation with ROA and ROE and findings of this study contradicts. The contradictory result here maybe due to interest rates adjustments by banks in Nepal and also due to higher increase in deposit rate than the loan rate and increase the risk to banks.

Research Implication

This study has both the practical and research implications. This study certainly provides evidence and contributes to the existing literature in the field of governance, banking, risk management and supervision. In terms of theoretical aspects, this has given generalizable results in case of Nepal using an appropriate methodology with substantial data in the period of significant activities and changes in the banking. The methodology and findings are the major contribution in the body of knowledge. Researchers and scholars may refer to this study for review as well while developing their proposal and in the process of conducting research.

In terms of practical implication, findings of this study are useful for central bank while formulating and implementing off-site supervision guidelines in the newly initiated risk based supervision approach. Hence, regulatory body can evaluate

and update the existing policy for risk management of commercial banks. Besides, regulators can consider finding of this study while allocating weights in monitoring performance and risk of commercial banks in Nepal. In addition, NRB's decision to switch from compliance based to risk based supervision, reduction of commercial banks from 32 to 28 through merger of four among them, NRB's decision to increase the minimum capital from 2 billion to 8 billion can be examined and explained to help users understand the purpose and consequences.

On top of that, commercial banks will prioritize on which aspect to focus while designing the risk evaluation matrix. This study has identified quality of assets as the most important area to focus for risk management. Similarly, participants of capital markets can refer to the findings and apply while taking their investment decisions and constructing efficient portfolio.

Above all, savers and depositors may also consider fundamental factors of riskiness at banks before taking their decisions in addition to the offered interest rates and their convenience.

Critique of the Study

This study has some limitations and gives opportunities to future researchers. The first critique maybe the sampling biasness as it considers only the commercial banks not the development banks, finance companies and microfinances. In addition, this study has considered CAMELS as the parameters for supervision tools and validated with literatures and based at various ratios to establish the relationship. However, supervision can be quantitative as well as qualitative and the qualitative aspects are missing over here. Qualitative facts considered by central bank in the inspection process such as quality of meetings, number of meetings conducted by each commercial banks, audit committee and their meetings, quality of internal and

external auditing, loan processing documents and various other regular activities and their procedures are not considered in the study.

In addition, this study has used only the secondary data to reach to the conclusion. However, inclusion of primary data would help in validating the results and broaden the scope of discussion section. Further, there may be various other studies conducted in the area to help designing alternative methods to use and check the differences in findings. Consideration of various other researches would enrich its literature review part as well as discussion section.

In overall, future researchers can consider above critiques and limitations of the study to make their findings more generalizable.

REFERENCES

Abata, M. A. (2014). Asset quality and bank performance: A study of commercial banks in Nigeria. *Research Journal of Finance and Accounting, 5*(18), 39-44.

Abrigo, M. R., & Love, I. (2015). *Estimation of panel vector autoregression in Stata: A package of programs* (Manuscript). Retrieved from http://paneldataconference2015.ceu.hu/Program/Michael-Abrigo.pdf

Aftab, N., Samad, N., & Husain, T. (2015). Historical analysis of bank profitability using CAMEL Parameters: Role of ownership and political regimes in Pakistan. *International Journal of Economics and Finance, 7*(2), 144-157.

Anees, M., Saqib, M., & Memon, D. (2008). Identification of factors affecting construction productivity in Pakistan industry. *Management, 4*, 37-48.

Aspal, P. K., & Dhawan, S. (2014). Financial performance assessment of banking sector in India: A case study of old private sector banks. *The Business & Management Review, 5*(3), 196-207.

Babar, H. Z., & Zeb, G. (2011). *CAMELS rating system for banking industry in Pakistan.* (Unpublished Master Thesis). Umea School of Business, Pakistan.

Baral, K. J. (2005). Health check-up of commercial banks in the framework of CAMEL: A case study of joint venture banks in Nepal. *Journal of Nepalese Business Studies, 2*(1), 41-55.

Barth, J.R., Caprio Jr.,G., & Levine, R. (2003). Bank regulation and supervision: what works best? *Journal of Financial Intermediation, 13*, 205–248.

Barth, M. E., & Landsman, W. R. (2010). How did financial reporting contribute to the financial crisis? *European Accounting Review, 19*(3), 399-423.

Barth, M. E., Beaver, W. H., & Landsman, W. R. (2001). The relevance of the value relevance literature for financial accounting standard setting: Another view. *Journal of Accounting and Economics*, *31*(1-3), 77-104.

Basel Committe on Banking Supervision. (2012). *Core principles for effective banking supervision.* Bank for International Settlements.

Bernanke, B. S. (2007). *Central banking and bank supervision in the United States.* Retrieved from https://ideas.repec.org/p/fip/fedgsq/250.html

Bloem, A. M., & Freeman, R. (2005). *The treatment of nonperforming loans.* International Monetary Fund, Statistics Department. Retrieved from https://www.imf.org/external/pubs/ft/bop/2005/05-29.pdf

Blundell, R., & Bond, S. (2000). GMM estimation with persistent panel data: An application to production functions. *Econometric Reviews*, *19*(3), 321-340.

Bond, S., Hoeffler, A., & Temple, J. (2001). *GMM estimation of empirical growth models* (CEPR discussion paper no 3048). Retrieved from http://citec.repec.org/d/nuf/econwp/0121.html

Bouheni, F. B. (2013, April). *The effects of supervision on banking performance: European evidence. Proceedings of the International conference on Governance and control in finance and banking: A new paradigm for risk and performance* (pp. 18-19). Paris, France.

Bouheni, F. B., Ameur, H. B., Cheffou, A. I., & Jawadi, F. (2014). The effects of regulation and supervision on European banking profitability and risk: A panel data investigation. *Journal of Applied Business Research*, *30*(6), 16-65.

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics using stata* (Vol. 2). College Station, TX: Stata Press.

Chortareas, G. E., Girardone, C., & Ventouri, A. (2012). Bank supervision, regulation, and efficiency: Evidence from the European Union. *Journal of Financial Stability*, *8*(4), 292-302.

Dang, U. (2011). *The CAMEL rating system in banking supervision. A case study*. Retrieved from https://www.theseus.fi/bitstream/handle/10024/38344/Dang_Uyen.pdf?...1

Dechow, P. M., & Schrand, C. M. (2004). *Earnings quality*. Retrieved from http://www.cfapubs.org/doi/pdf/10.2470/rf.v2004.n3.3927?cookieSet=1

Demirgüç-Kunt, A., & Detragiache, E. (2002). Does deposit insurance increase banking system stability? An empirical investigation. *Journal of Monetary Economics*, *49*(7), 1373-1406.

Demirguc-Kunt, A., Detragiache, E., & Tressel, T. (2006). *Banking on the principles: Compliance with Basel core principles and bank soundness*. Washington DC: The World Bank.

Demirgüç-Kunt, A., Honohan, P., & Beck, T. (2008). *Finance for all?: Policies and pitfalls in expanding access*. Washington DC: The World Bank.

Doytch, N., & Uctum, M. (2011). Does the worldwide shift of FDI from manufacturing to services accelerate economic growth? A GMM estimation study. *Journal of International Money and Finance*, *30*(3), 410-427.

Forster, J., & Shaffer.S. (2005). Bank efficiency ratios in Latin America. *Applied Economics Letters, 12*(9), 529-532.

Gilbert, R. A., Meyer, A. P., & Vaughan, M. D. (2000). *The role of a CAMEL downgrade model in bank surveillance* (Working paper series, 2000-021). Federal Reserve Bank of St. Louis, USA.

Gilbert, R. A., Meyer, A. P., & Vaughan, M. D. (2002). Could a CAMELS downgrade model improve off-site surveillance? *Federal Reserve Bank of St. Louis Review*, *84*(1), 47-63.

Grier, W. A. (2007). *Credit analysis of financial institutions* (2nd ed.). London: Euromoney Books.

Grootveld, H., & Hallerbach, W. (1999). Variance vs downside risk: Is there really that much difference? *European Journal of Operational Research*, *114*(2), 304-319.

Gupta, P. K. (2014). An analysis of Indian public sector banks using CAMEL approach. *IOSR Journal of Business and Management*, *16*(1), 94-102.

Hays, H. F., Stephen, A., & Arthur, H. (2009). Efficiency ratios and community bank performance. *Journal of Finance and Accountancy, 5*(2), 1-15.

Heffernan, S. A., & Fu, X. (2008). *The determinants of bank performance in China.* Retrieved from https://www.cass.city.ac.uk/_data/assets/pdf_file/0004/28984/china-bk-performance-july-2008.pdf http://www.federalreserve.gov/newsevents/speech/bernanke20070105a.htm

Hull, J.C. (2014). *Options, futures and other derivatives*. New Delhi: Pearson.

Jha, S., & Hui, X. (2012). A comparison of financial performance of commercial banks: A case study of Nepal. *African Journal of Business Management*, *6*(25), 7601-7611.

Klomp, J., & De Haan. (2011). Banking risk and regulation: Does one size fit to all? *Journal of Banking and Finance, 36*, 3197-3212.

Laeven, L., & Levine, R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics, 93,* 259-275.

Levine, R. (2012). The governance of financial regulation: Reform lessons from the recent crisis. *International Review of Finance, 12*(1), 39-56.

Litan, R., & Hawke, J. (2012). *Value-added bank supervision: A Framework for safely fostering economic growth.* Washington, DC, American Bankers Association.

Mileva, E. (2007). Using Arellano-Bond dynamic panel GMM estimators in Stata. *Economics Department, Fordham University*, 1-10.

Naceur, S. B., & Omran, M. (2011). The effects of bank regulations, competition, and financial reforms on banks' performance. *Emerging Markets Review, 12*(1), 1-20.

Nepal Rastra Bank. (2016). *Bank supervision report*. Kathmandu: Author.

Panta, S. B., & Bedari, D. P. (2015). Cost efficiency of Nepali commercial banks in the context of regulatory changes. *NRB Economic Review, 27*(2), 1-16.

Pradhan, R. P., Arvin, M. B., & Ghoshray, A. (2015). The dynamics of economic growth, oil prices, stock market depth, and other macroeconomic variables: Evidence from the G-20 countries. *International Review of Financial Analysis, 39*, 84-95.

Pradhan, R. S., & Shrestha, D. (2016). *Impact of liquidity on bank profitability in Nepalese commercial banks*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2793458

Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological Methodology*, 111-163.

Rollinger, T. N., & Hoffman, S. T. (2013). Sortino: A 'Sharper'Ratio. *Chicago, IL: Red Rock Capital.* Retrieved from http://www.redrockcapital.com/assets/RedRock_Sortino_white_paper.pdf

Roodman, D. (2006, July). How to do xtabond2. In *North American Stata users' group meetings 2006* (No. 8). New York, NY: Stata Users Group.

Sargan, J. D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica: Journal of the Econometric Society*, 393-415.

Sarker, A. (2005). CAMELS rating system in the context of Islamic banking: A proposed 'S'for Shariah framework. *Journal of Islamic Economics and Finance*, *1*(1), 78-84.

Shehzad, C. T., de Haan, J., & Scholtens, B. (2010). The impact of bank ownership concentration on impaired loans and capital adequacy. *Journal of Banking & Finance*, *34*(2), 399-408.

Stewart, F. (2009). *Pension funds' risk-management framework: Regulation and supervisory oversight*. Retrieved from http://search.oecd.org/daf/fin/private-pensions/44633539.pdf

Sufian, F. (2011). Profitability of the Korean banking sector: Panel evidence on bank-specific and macroeconomic determinants. *Journal of Economics and Management*, *7*(1), 43-72.

Sufian, F., & Chong, R. R. (2008). Determinants of bank profitability in a developing economy: Empirical evidence from the Philippines. *Asian Academy of Management Journal of Accounting and Finance*, *4*(2), 91-112. Retrieved from http://web.usm.my/journal/aamjaf/vol%204-2-2008/4-2-5.pdf

Sufian, F., & Chong, R. R. (2008). Determinants of bank profitability in a developing economy: empirical evidence from the Philippines. *Asian Academy of Management Journal of Accounting & Finance*, *4*(2), 91-112.

Teker, D., Teker, S., & Sönmez, M. (2011). Economic value added performances of publicly owned banks: Evidence from Turkey. *International Research Journal of Finance and Economics*, *75*, 132-137.

APPENDIX I

Tables

Table 8

Effect of Supervision (CAMELS) on Risk Measured by Downside Deviation of ROA with Capital Adequacy Variables

Down Side Deviation of ROA	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Down Side Deviation of ROA L1	0.2604532	0.0577769	4.51	0***	0.1472	0.3736939
Core Capital to Risk Weighted Assets	-0.0000785	0.0005199	-0.15	0.88	-0.001	0.0009404
Capital Fund to Risk Weighted Assets	0.0036078	0.0060303	0.6	0.55	-0.008	0.015427
Non-Performing Loan to Total Loan	0.0363443	0.0095758	3.8	0***	0.0176	0.0551126
Loan Loss Reserve to Total Loans and Advances	-0.0639601	0.0237896	-2.69	0.007***	-0.111	-0.0173333
Operating Expenses Ratio	0.015232	0.0093162	1.64	0.102*	-0.003	0.0334913
Net Profit Margin	-0.0208057	0.0025329	-8.21	0***	-0.026	-0.0158413
Net Interest Income to Total Assets	-0.0398739	0.073999	-0.54	0.59	-0.185	0.1051616
Liquid Assets to Total Deposits	0.0000508	0.0020749	0.02	0.98	-0.004	0.0041175
Credit to Deposit Ratio	-0.003427	0.0059054	-0.58	0.562	-0.015	0.0081473
Exchange Gain(Loss) to Net Gain (Loss)	-0.0003704	0.0012489	-0.3	0.767	-0.003	0.0020775
Weighted Average Interest Spread	-0.0891656	0.0665337	-1.34	0.18	-0.22	0.0412381
GDP growth Rate	-0.0023069	0.01068	-0.22	0.829	-0.023	0.0186255
Inflation	0.0481259	0.0238299	2.02	0.043**	0.0014	0.0948316
DUM1JV	0.011628	0.0071415	1.63	0.1*	-0.002	0.0256251
DUM2PVT	0.0030696	0.0078466	0.39	0.696	-0.012	0.0184487
DUMCA	-0.0017055	0.0018715	-0.91	0.362	-0.005	0.0019626
cons	0.0006472	0.0090397	0.07	0.943	-0.017	0.0183647

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

Table 9

Effect of Supervision (CAMELS) on Risk Measured by Downside Deviation of ROA with BASEL II as Capital Adequacy Dummy

Down Side Deviation of ROA	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Down Side Deviation of ROA L1	0.2577718	0.0571827	4.51	0***	0.1456958	0.3698478
Non-Performing Loan to Total Loan	0.0335778	0.0091224	3.68	0***	0.0156983	0.0514573
Loan Loss Reserve to Total Loans and Advances	-0.0636521	0.023002	-2.77	0.006***	-0.1087351	-0.0185691
Operating Expenses Ratio	0.0159844	0.0091843	1.74	0.082*	-0.0020164	0.0339853
Net Profit Margin	-0.0203289	0.0024771	-8.21	0***	-0.0251838	-0.0154739
Net Interest Income to Total Assets	-0.0459658	0.0730696	-0.63	0.529	-0.1891796	0.0972481
Liquid Assets to Total Deposits	0.0000948	0.0020458	0.05	0.963	-0.0039148	0.0041044
Credit to Deposit Ratio	-0.0020638	0.0057569	-0.36	0.72	-0.0133471	0.0092195
Exchange Gain(Loss) to Net Gain (Loss)	-0.0005626	0.0012385	-0.45	0.65	-0.00299	0.0018647
Weighted Average Interest Spread	-0.0982755	0.0656595	-1.5	0.134	-0.2269656	0.0304147
GDP growth Rate	-0.0032549	0.010604	-0.31	0.759	-0.0240382	0.0175285
Inflation	0.0463511	0.0232258	2	0.046**	0.0008292	0.0918729
DUM1JV	0.0122816	0.0067452	1.82	0.069*	-0.0009387	0.0255019
DUM2PVT	0.0034059	0.0072787	0.47	0.64	-0.01086	0.0176719
DUMCA	-0.0017194	0.0018583	-0.93	0.355	-0.0053617	0.0019229
_cons	0.0003796	0.0086062	0.04	0.965	-0.0164881	0.0172474

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

Table 10

Effect of Supervision (CAMELS) on Risk Measured by Downside Deviation of ROE with Capital Adequacy Variables

Down Side Deviation of ROE	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Down Side Deviation of ROE L1	0.00828	0.065261	0.13	0.899	-0.1196298	0.1361899
Core Capital to Risk Weighted Assets	0.000236	0.005675	0.04	0.967	-0.0108865	0.0113576
Capital Fund to Risk Weighted Assets	-0.07533	0.06263	-1.2	0.229	-0.198084	0.047419
Non-Performing Loan to Total Loan	0.123707	0.111565	1.11	0.268	-0.0949569	0.3423704
Loan Loss Reserve to Total Loans and Advances	-0.01879	0.245495	-0.08	0.939	-0.4999462	0.4623753
Operating Expenses Ratio	0.103441	0.103582	1	0.318	-0.0995759	0.3064576
Net Profit Margin	-0.00391	0.026534	-0.15	0.883	-0.0559188	0.048093
Net Interest Income to Total Assets	-0.70337	0.778912	-0.9	0.367	-2.230007	0.8232726
Liquid Assets to Total Deposits	0.024007	0.021897	1.1	0.273	-0.0189104	0.0669247
Credit to Deposit Ratio	-0.1011	0.061405	-1.65	0.1*	-0.2214552	0.0192467
Exchange Gain Loss to Net Gain	-0.00139	0.013087	-0.11	0.915	-0.0270399	0.02426
Weighted Average Interest Spread	-0.90692	0.637128	-1.42	0.155	-2.155672	0.3418251
GDP Growth Rate	0.146398	0.11166	1.31	0.19	-0.0724516	0.3652485
Inflation	-0.07758	0.211595	-0.37	0.714	-0.4923034	0.3371351
DUM1JV	0.003378	0.054584	0.06	0.951	-0.1036055	0.1103616
DUM2PVT	0.007237	0.04475	0.16	0.872	-0.0804716	0.0949465
_cons	0.103629	0.072192	1.44	0.151	-0.0378653	0.2451235

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

Table 11

Effect of Supervision (CAMELS) on Risk Measured by Downside Deviation of ROE with BASEL II as Capital Adequacy Dummy

Down Side Deviation of ROE	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Down Side Deviation of ROE L1	0.006418	0.071967	0.09	0.929	-0.13463	0.147471
Non-Performing Loan to Total Loan	0.199154	0.119814	1.66	0.096*	-0.03568	0.433986
Loan Loss Reserve to Total Loans and Advances	-0.29101	0.267015	-1.09	0.276	-0.81435	0.232333
Operating Expenses Ratio	0.226133	0.113991	1.98	0.047**	0.002716	0.44955
Net Profit Margin	-0.01676	0.028825	-0.58	0.561	-0.07326	0.039737
Net Interest Income to Total Assets	-0.31165	0.858034	-0.36	0.716	-1.99337	1.370063
Liquid Assets to Total Deposits	0.028501	0.024269	1.17	0.24	-0.01907	0.076067
Credit to Deposit Ratio	-0.13932	0.065208	-2.14	0.033**	-0.26712	-0.01151
Exchange Gain Loss to Net Gain	-0.00176	0.014408	-0.12	0.903	-0.03	0.026479
Weighted Average Interest Spread	-0.91728	0.730294	-1.26	0.209	-2.34863	0.514072
GDP Growth Rate	0.202041	0.127082	1.59	0.112	-0.04703	0.451117
Inflation	0.329297	0.279422	1.18	0.239	-0.21836	0.876954
DUM1JV	0.009878	0.061137	0.16	0.872	-0.10995	0.129705
DUM2PVT	0.048637	0.049777	0.98	0.329	-0.04892	0.146197
DUMCA	-0.02832	0.017178	-1.65	0.099*	-0.06199	0.005347
_cons	0.038693	0.080157	0.48	0.629	-0.11841	0.195798

Table 12

Effect of Supervision (CAMELS) on Risk Measured by Standard Deviation of ROA with Capital Adequacy Variables

Standard Deviation of ROA	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Standard Deviation of ROA L1	0.016691	0.061546	0.27	0.786	-0.10394	0.1373193
Core Capital to Risk Weighted Assets	-0.00029	0.001597	-0.18	0.858	-0.00341	0.0028445
Capital Fund to Risk Weighted Assets	-0.03502	0.015941	-2.2	0.028**	-0.06627	-0.0037804
Non-Performing Loan to Total Loan	0.131437	0.031202	4.21	0***	0.070283	0.1925913
Loan Loss Reserve to Total Loans and Advances	-0.0664	0.067634	-0.98	0.326	-0.19896	0.0661634
Operating Expenses Ratio	0.027722	0.026496	1.05	0.295	-0.02421	0.0796519
Net Profit Margin	-0.00945	0.007244	-1.3	0.192	-0.02364	0.0047522
Net Interest Income to Total Assets	-0.07934	0.202283	-0.39	0.695	-0.47581	0.3171274
Liquid Assets to Total Deposits	-0.018	0.013075	-1.38	0.169	-0.04363	0.0076247
Credit to Deposit Ratio	-0.04621	0.019359	-2.39	0.017**	-0.08415	-0.0082632
Exchange Gain Loss to Net Gain	0.001047	0.00348	0.3	0.764	-0.00577	0.0078667
Weighted Average Interest Spread	-0.31672	0.174785	-1.81	0.07*	-0.65929	0.0258531
GDP Growth Rate	-0.00584	0.027579	-0.21	0.832	-0.0599	0.0482105
Inflation	-0.05688	0.060183	-0.95	0.345	-0.17484	0.0610713
DUM1JV	0.122427	0.025219	4.85	0***	0.073	0.1718544
DUM2PVT	0.089497	0.024203	3.7	0***	0.042059	0.1369348
_cons	-0.0274	0.028389	-0.97	0.334	-0.08304	0.0282412

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

Table 13

Effect of Supervision (CAMELS) on Risk Measured by Standard Deviation of ROA with BASEL II as Capital Adequacy Dummy

Standard Deviation of ROA	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Standard Deviation of ROA L1	-0.02749	0.059563	-0.46	0.644	-0.14423	0.089255
Non-Performing Loan to Total Loan	0.130727	0.027827	4.7	0***	0.076187	0.185267
Loan Loss Reserve to Total Loans and Advances	-0.06678	0.063985	-1.04	0.297	-0.19218	0.058633
Operating Expenses Ratio	0.017681	0.025409	0.7	0.487	-0.03212	0.067482
Net Profit Margin	-0.00866	0.006813	-1.27	0.204	-0.02201	0.004693
Net Interest Income to Total Assets	-0.24719	0.195411	-1.26	0.206	-0.63019	0.135807
Liquid Assets to Total Deposits	-0.02558	0.012389	-2.06	0.039**	-0.04986	-0.0013
Credit to Deposit Ratio	-0.03837	0.018054	-2.13	0.034**	-0.07375	-0.00298
Exchange Gain Loss to Net Gain	0.001661	0.003304	0.5	0.615	-0.00482	0.008138
Weighted Average Interest Spread	-0.12023	0.170772	-0.7	0.481	-0.45493	0.214479
GDP Growth Rate	0.020788	0.02679	0.78	0.438	-0.03172	0.073295
Inflation	0.120547	0.070195	1.72	0.086*	-0.01703	0.258128
DUM1JV	0.141558	0.02325	6.09	0***	0.095989	0.187127
DUM2PVT	0.108572	0.022425	4.84	0***	0.064619	0.152525
DUMCA	-0.02018	0.004781	-4.22	0***	-0.02955	-0.01081
_cons	-0.05447	0.027024	-2.02	0.044**	-0.10744	-0.00151

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

Table 14

Effect of Supervision (CAMELS) on Risk Measured by Standard Deviation of ROE with Capital Adequacy Variables

Standard Deviation of ROE	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Standard Deviation of ROE L1	0.4264406	0.070717	6.03	0***	0.287838	0.5650435
Core Capital to Risk Weighted Assets	-0.0023651	0.008425	-0.28	0.779	-0.01888	0.0141477
Capital Fund to Risk Weighted Assets	0.0088279	0.084379	0.1	0.917	-0.15655	0.1742067
Non-Performing Loan to Total Loan	0.8268057	0.166224	4.97	0***	0.501013	1.152599
Loan Loss Reserve to Total Loans and Advances	-1.287517	0.344261	-3.74	0***	-1.96226	-0.6127774
Operating Expenses Ratio	-0.0668986	0.13379	-0.5	0.617	-0.32912	0.1953252
Net Profit Margin	-0.1135862	0.035364	-3.21	0.001***	-0.1829	-0.0442737
Net Interest Income to Total Assets	1.702091	1.118331	1.52	0.128	-0.4898	3.89398
Liquid Assets to Total Deposits	0.060542	0.064339	0.94	0.347	-0.06556	0.1866434
Credit to Deposit Ratio	-0.0568064	0.1	-0.57	0.57	-0.2528	0.13919
Exchange Gain Loss to Net Gain	-0.0145206	0.017681	-0.82	0.411	-0.04917	0.0201328
Weighted Average Interest Spread	0.0983873	0.969042	0.1	0.919	-1.8009	1.997675
GDP Growth Rate	-0.1419652	0.149246	-0.95	0.341	-0.43448	0.1505522
Inflation	0.1207769	0.322478	0.37	0.708	-0.51127	0.7528217
DUM1JV	-0.0698142	0.063739	-1.1	0.273	-0.19474	0.0551111
DUM2PVT	0.0300322	0.076322	0.39	0.694	-0.11956	0.1796209
_cons	0.0287435	0.114376	0.25	0.802	-0.19543	0.252916

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01

Table 15

Effect of Supervision (CAMELS) on Risk Measured by Standard Deviation of ROE with BASEL II as Capital Adequacy Dummy

Standard Deviation of ROE	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Standard Deviation of ROE L1	0.417747	0.071648	5.83	0***	0.277319	0.558176
Non-Performing Loan to Total Loan	0.750335	0.165991	4.52	0***	0.425	1.075671
Loan Loss Reserve to Total Loans and Advances	-1.31213	0.337047	-3.89	0***	-1.97273	-0.65153
Operating Expenses Ratio	-0.07212	0.131415	-0.55	0.583	-0.32968	0.185453
Net Profit Margin	-0.11929	0.0338	-3.53	0***	-0.18553	-0.05304
Net Interest Income to Total Assets	1.808504	1.116363	1.62	0.105*	-0.37953	3.996535
Liquid Assets to Total Deposits	0.06764	0.063937	1.06	0.29	-0.05768	0.192954
Credit to Deposit Ratio	-0.0438	0.098891	-0.44	0.658	-0.23762	0.150021
Exchange Gain Loss to Net Gain	-0.01312	0.017541	-0.75	0.455	-0.0475	0.021263
Weighted Average Interest Spread	0.156548	0.96061	0.16	0.871	-1.72621	2.039308
GDP Growth Rate	-0.14668	0.154712	-0.95	0.343	-0.44991	0.156554
Inflation	0.187816	0.393372	0.48	0.633	-0.58318	0.958812
DUM1JV	-0.02747	0.064852	-0.42	0.672	-0.15457	0.099639
DUM2PVT	0.056714	0.071794	0.79	0.43	-0.084	0.197428
DUMCA	-0.00969	0.029123	-0.33	0.739	-0.06677	0.047394
_cons	-0.00891	0.108798	-0.08	0.935	-0.22215	0.204333

Note. The z statistics in parentheses * p<0.10, ** p<0.05 and *** p<0.01