CHAPTER - I

INTRODUCTION

1.1 General Background

Financial institution in Nepal, as an organized sector for capital mobilization, was started after the advent of Nepal Bank Limited in 1994. It was the pioneer institution of modern banking system. Before that "Tejrath Adda'' was fulfilling the banking need of the people, to some extent, by providing Loan on security, Nepal Rastra BankWas established on 14th Baisakh 2013 B.S. under Nepal Rastra Bank Act 2012 to monetize the economy and to avoid the duel monetary system. Nepal Rastra Bank is the Central Bank, which formulates monetary and fiscal policies to strengthen and develop the financial system. A fully government owned bank; Rastriya Banijya Bank was established in 2022 B.S. under its respective Act. After the restoration of the democracy in 2046 B.S. and liberalization policy adopted by government, some commercial banks, development banks and finance companies emerged to provide banking facilities to the people. According to NRB,26 Commercial banks, 58 development banks, 152 finance companies, 42 co-operatives societies and 68 financial NGOs are in operation taking license from Nepal Rastra Bank (Mid January 2008).

These different institutions collect money from public in different forms and invest in different sectors in different forms. These organizations survive by making profit and profit for these institutions are different between the interest rate they provided and earned minus operating expenses. So, interest rate in crucial in survival and development of financial institutions.

1.1.1 Interest: The Price of Money

When we examine how money affects economic activity, we will focus on the interest rate, which is often called "The price of money". Interest is the payment made for the use of money. The interest rate is the amount of the interest paid per unit of time expressed as a percentage of the amount borrowed. In other words, people must pay opportunity to borrow money. The cost of borrowing money, measured in rupee per year per rupee

borrowed, is the interest rate. Financial institutions, as financial intermediaries, collect money from savers in the form of deposit and provide that for business sector in the form of loan. These institutions pay the interest to the depositors for the money-borrowed from them and charge interest from the borrowers for money-landed to them.

As defined earlier, the interest rate is the price of money: the price renting the use of resources that money commands for a specified period. As with any price determined by the free market play of demand and supply in a market economy, the price of money- the interest rate plays a vital role in the allocation of resources and in the decision making of consumers and businesses. For example, an increase in the interest rate provides additional incentives to individuals and others to postpone current consumption (save) and thereby free resources for investment. Government policies intended to expand the volume of saving; should aim at increasing the attractiveness of saving by increasing the return to saving- the interest. Interest rates send price signals to borrowers, lenders, and savers. Higher interest rates generally bring forth a greater volume of savings and stimulate the lending of funds. Lower rate of interest, on the other hand, tend to dampen the flow of borrowing and reduce lending activity. Higher interest rates tend to reduce the volume of borrowing and capital investment, and lower rates stimulate borrowing and investment spending (*Rose, 1997:101*).

Investment is function of interest rate. The quality and flow of investment determines the income in the economy. Therefore, the impact of interest rate is on both the saving and investment in the economy. Further, the borrowings and savings are always influenced by the interest rates. The cost of production, which depends upon the production function, is influenced by the interest rate, since the credit is also one of the components of production process. The saving and investment in the economy, which are influenced by the interest rates, are the real economic variables. The incomes and expenditures of the variable sectors of the economy result in excess savings or excess investment in each of the sectors. The sector having excess savings provide them to those with excess investment.

Interest rate in the free market economy is determined by the free interplay of the demand and supply forces. Although interest rate is influence by various factors, the main factors that determine the interest rate are demand for and supply of loan able fund. If supply increases and demand remains constant, interest rates in the market decrease. Similarly, if demand for loan able fund increases and supply remain constant, interest rates in the market increase. However, Nepalese economy has not developed up to that level so that free market can determine the interest rates. Nepal Rastra Bank, as a guardian, fixes the terms and conditions regarding the interest and other activities of financial institutions in Nepal. However, in recent years, banks are permitted to fix the interest rate they charge and offer on loan and deposit.

1.1.2 Brief History of Interest Rate in Nepal

While observing the historical background of the interest rate structure of Nepal, frequent changes can be noticed. In the beginning, the interest rate charged and offered by banks and financial institutions was mentioned at a lower level with a view to stimulate real income and employment. However, dramatic change had been made time to time. A study of the annual reports of Nepal Rastra Bank (NRB) avails the changes made, the objectives behind such changes and their justifications (*Annual Report-2008 NRB*).

On April 13, 1965, the interest on deposits was increased by one percentage point that prevailed to August 30, 1966. Similarly, other two categories of fixed deposits 3 to 5 years and above five years were created and interest rates on those two types of deposits were 5 percent and 6 percent respectively. On August 31, 1966, the interest rate on all types of deposit was increased approximately by one percentage point. The interest structure was again revised on April 14, 1971. The rate of interest on saving deposits were raised to 5 percent (increased by 0.5 percentage point) but the rate of interest on 3 months and 6months fixed deposit were reduced. However, the rate on fixed deposits having the maturities of more than one year was raised varyingly by 1 to 1.75 percentage points. Another change in interest rate structure was introduced on July 16, 1974. The interest rate on saving deposits was fixed at 6.5 percent; that on fixed deposits of three and six months maturities were kept constant and interest rate on all other categories of

fixed deposits were raised by tow percentage points. The lending rates of commercial banks were also revised respectively. The lending rates were lowered in some cases, however, the loan for unproductive purposes were made costlier by two percentage points. Giving different justifications, NRB issued directives to the banks and financial institutions to apply new interest rates from April 18, 1975 which was a drastic change. The interest rate was increased from 6.5% to 8% on saving deposits and that on fixed deposits of 3 months and 6 months were increased to 4 percent and 10 percent respectively. The interest rate on one-year deposits was increased from 9.5 percent to 16 percent and all two years and above fixed deposits rate was increased from 9.75 percent to 16 percent. Prior to the revision there were nine different categories of lending carrying the interest rate between 8 to 15 percent. But the revision categorized the loan only in two categories. 15 percent interest rate was applicable to all the loans to small sectors, agriculture sector, industry, export credit and credit against development bonds whereas 18 percent minimum rate was fixed for other purposes. The interest rate on the loan against fixed deposit receipts was fixed two percent high than on fixed deposits. On February 12, 1977, NRB revised interest rate again. The rate offered on savings and three month fixed deposits was lowered to 9 percent (by one percentage point). However, the interest rate on one year fixed deposits was lowered by two-percentage point to 12 percent and that on two years and above fixed deposit was declined by two-percentage point. Next amendment in interest rate was made on 15 June 1982, and the interest rates on all types of deposits were increased by 0.5 percentage point. In addition, the lending rates on all types of loans were raised by one percentage point. NRB authorized the commercial banks and other financial institutions to charge an additional 2.5 percent interest above the specific rate on all over due loans and minimum of 17 percent interest rate on misutilised loan to agriculture, industry and service sectors. A provision of one percent rebate for timely repayments was also made. NRB further revised the interest rate on August 17, 1982, which was a slight change on lending rate only. Giving right in offering the interest rate on saving and time deposit to the extent of 1.5 percent and 1 percent respectively above prevailing rate, NRB issued direction to the commercial banks. On May 29, 1986, commercial banks and financial institutions were given freedom in fixing the interest rate on deposits and loans. However, the higher limit and

lower limit was fixed by NRB. The minimum of 8.5 percent interest rate was fixed for saving deposits. The rate on fixed deposits of less than one year's maturity needed to be at least not less that the rate on saving deposits. Minimum of 12 percent interest rate was fixed on one year fixed deposits. The interest rate on more than one year's fixed deposits could be fixed by the banks themselves but that ought to be higher that the rate on one year fixed deposit. Banks and financial institutions were given freedom to fix lending rate subject to a minimum of 15 percent for the priority sector.

On August 31, 1989, commercial banks and financial institutions were granted complete freedom in determining their own deposit and lending rates. They had also been given complete freedom to make rules and working procedures about the kinds of deposits, time period of deposits, repayment conditions, penal interest rates and interest capitalization on over due loans. NRB since then it has not administered and regulated interest rate. Monetary management has been conducted through open market operation. However, on August 22, 1992, NRB issued some directives to banks and financial institutions to clearly spell out the interest on deposits of at least up to one year, not to create the range of percentage in interest rates on credit of same types and purposes and, to stop fixing the interest rate on flat basis. In addition to this, NRB also instructed the bank and financial institutions to limit their interest rate on deposit and credit at 6 percent within the mid-December 1993. Then after, NRB has not regulated interest directly but has given instructions in time-to-time regarding the interest rate and terms and conditions of lending and keeping accounts. A last instruction to banks and financial institutions was issued in 2002. Currently interest rate spread required to be maintained by bank and financial institutions has also been removed.

As previously stated, the interest rate structure in the beginning was purely central bank's matter of concern. But considering the needs of the country, NRB took a flexible approach in making some adjustments in interest rates by putting control on it. However, the impact of economic liberalization in developing countries because of financial globalization began to influence Nepal. This ultimately brought deregulation in interest rate by leaving the interest rate to be determined by market forces.

1.1.3 Profile of selected Commercial Banks

Commercial banks in Nepal have been establishing to maintain economic facilities and welfare; to provide loan to agriculture, industry and for commercial purpose; and to provide banking services and facilities to the public. Commercial banks, in Nepal, establish under the company act and commercial bank act. Currently 26 commercial banks with in country are operating their functions – adopting deposit, providing loans and more others. Similarly, NBBL was established to improve the rural activities in Nepal. The word bank only means to focus commercial bank. In short, we could say those organizations whose transaction is money and credit said to be bank. The word bank is said to have organized from the French word "Banque" and Italian word "Banca". Its literal meaning is to lend cash money and to exchange money sitting on the bench respectively. In ancient time, goldsmith where exchanging money sitting on the bench. Their branches used to be broken by the depositors when they were unable to meet their liabilities. Gradually people started to keep their gold, metals and coins and other valuable ornaments with goldsmith and moneylenders. It was observed that money was not withdrawn at once. Hence they started lending on interest. They started to lend deposited money for the short time period. They received interest from their invested amount. Later on that type of transaction were developed as banking transaction and the bank is originated.

In other word, the bank is an institution whose essential operation is to take deposit from public and to lend money. Banks accumulate idle money from public by providing attractive sound interest rate in their deposits and disburse the collected deposits as a loan to business organizations, industry, agriculture sectors and needy people etc. So we can say that the main task of commercial bank is to mobilize idle source in productive areas by collecting it from scattered sources and generating profit. The bank plays an important role in our economy by providing effective service efficiently towards the attainment of economic development.

Banking has come to present advanced from through various stages. Traditional form of banking was traced during the civilization of Greek, Rome and Mesopotamia. But the

first modern banking institution was originated at Italy in 1157 A.D. named as “The Bank of Venice”. “The Bank of England” was established in 1694 A.D. as the first central bank; add a strong brick on the development of banking sector. After this evolution, there came a remarkable change in the process of establishing the banking institution. This was a big landmark in the history of banking development. The ideal of commercial banks rapidly spread all over the world only after the foundation of this bank.

In Nepal, banking in true sense of term started with the inception of “Nepal Bank Ltd” on 30th Kartik, 1994 B.S. is carried out functions of commercial bank. Having felt the need of a central bank, “Nepal Rastra Bank” was established in 2013 B.S. under the Central Bank Act, 2012 to fulfill the adequate services for increasing commercial activities in the country. “Rastriya Banijya Bank(R.B.B) was established in 2022 B.S. as a fully government owned commercial bank. Now there are 26 Commercial Banks in total. On the other hand, there are 152 finance companies, 5 rural development banks, one agriculture development bank and other many financial institutions.

Commercial Banks Approved by Nepal Rastra Bank to Perform Commercial Bank Functions Till the Date

S.N.	Name of Commercial Banks	Year of Establishment
1	Nepal Bank Limited	1937
2	Rastriya Banijya Bank	1965
3	Agriculture Development Bank Limited	1968
4	**NABIL (Nepal Arab Bank)**	1984
5	Nepal Investment Bank (Nepal Indosuez Bank)	1985
6	Standard Chartered Bank (Grindlays Bank)	1986
7	**Himalayan Bank Limited**	1992
8	Nepal SBI Bank Limited	1993
9	**Nepal Bangladesh Bank Limited**	1993
10	Everest Bank Limited	1994
11	**Bank of Kathmandu Limited**	1994
12	Nepal Credit and commerce Bank(Nepal Bank of Ceylon)	1996
13	Lumbini Bank Limited	1998
14	Nepal Industrial and Commercial Bank	1998
15	Machhapuchchhre Bank Limited	2000
16	Kumari Bank Limited	2000
17	Laxmi Bank Limited	2001
18	Siddhartha Bank Limited	2001
19	Global Bank Limited	2006
20	Citizen Bank International Limited	2007
21	Prime Bank Limited	2007
22	Sunrise Bank Limited	2007
23	Bank of Asia Nepal Limited	2007
24	Development Credit Bank	2008
25	Nepal Merchant Bank	2008
26	Kist Bank Limited	2009

Himalayan Bank Limited (HBL)

Himalayan Bank Limited was established in 1992 by the distinguished business personalities of Nepal in partnership with Habib Bank Limited, one of the largest commercial bank of Pakistan. Banks operation was commenced from January 1993. It is the first commercial bank of Nepal with maximum shareholding by the Nepalese private sector. Besides commercial activities, the Bank also offers industrial and merchant banking facilities. The bank at present has the five branches in Kathmandu Valley and

seven branches outside the valley. The bank is also operating a counter in the premise of the Royal Palace. The Bank has a very aggressive plan of establishing more branches in different parts of the kingdom in the near future. The bank's policy is to extend quality and personalized service to its customers as promptly as possible. The Bank, as far as possible, offers tailor made facilities to its clients, based on the unique needs and requirements, to extend more efficient services to its customers. Himalayan Bank has been adopting innovative and latest banking technology. This has not only helped the Bank to constantly improve its service level but has also kept it prepared for future adoption of new technology. HBL has listed on Nepal stock exchange in July 5, 1993. The share participation of the bank is 51% Nepalese promoters, 14% employment provident fund, 15% general public and 20% Habib Bank Pakistan. In this way only 20% is foreign ownership in this bank.

Nabil Bank

The history of banking dates back to sixteenth centuries. However, in Nepal formal banking system was introduced only in November 1937 with the establishment of Nepal Bank Limited (NBL) which is regarded as pioneer institution of modern banking system and served as a sole financial institution of the country for nearly two decades. Prior to the establishment of this bank, the banking needs of people were fulfill to certain extent only by the organized financial institutions “The Tejarath Adda”. However, the services it offered were not sufficient. Actually, the formation of high committee board “Udyog Parisad” was indeed a landmark in opening new venue in field of banking, industries and commerce. Accordingly NBL was established in November 1997 under Nepal Bank Act as joint venture between government and private sector and replaced the “Tejarath Adda” by taking over its operations and overcoming its limitations.

Nabil Bank Limited is the first commercial joint venture bank of Nepalese bank history, it was established in 1984, July 12 under the company all 1964. It was established under a technical service agreement with Dubai Bank Limited, Dubai, which was later merged with Emirates Bank Limited, Dubai.

Now its present shareholdings are distributed as follows:

1. 50% is owned by N.B. International Limited, Irland
2. 20% by Local Financial Institutions and
3. 30% by Nepalese Public

Nabil is amongst the most successful joint venture organization in Nepal registering strong growth in balance footings as well as profits year after year.

Nepal Bangladesh Bank Limited (NBBL)

A bank is an institution, which accepts deposit from public and intern advances loans by creating credit. In other words, a bank is an organization whose main operation are concerned with accumulation of temporary idle money of the general public for the purpose of advancing and lending to other expenditure. Bank collect deposit from general public by providing them sound interest and invest those accumulated fund to business houses, industry, agricultural sector and needy individual throughout the economy. Commercial banks are those who pool together the saving community and arrange for their productive use CB are the heat of financial system. CB occupies an important place in the economic development of our country CB, by playing active roles have changed the economic structure of the world.

Nepal Bangladesh Bank Ltd. was established in June 1994 under the company act 1964 with an authorized capital of Rs. 240 million and paid up capital of Rs. 60 million as a joint venture bank with IFIC bank of Bangladesh. Currently the bank has an authorized capital of Rs. 359.9 million. Its head office is situated at New Baneshwor, Bijuli Bazar, Kathmandu. The prime objective of this bank is to render banking services to the different sectors like industries, traders, businessmen, priority sector, small entrepreneurs and weaker section of the society and every other people who need banking services. During the period of 10 years of its operation it has been able to provide excellent services to its clients. The bank has introduced its first ATM facility at Kathmandu plaza, Putalisadak branch to give 24 hours 365 days banking services to their valued customers. The bank has earned the glory of making available the services to almost all the top

business houses of the country and it occupies one of the leading positions among the joint venture banks in Nepal. The bank is still pursuing to accommodate as many clients as far as possible.

Bank of Kathmandu (BOK)

Bank of Kathmandu Limited was incorporated in 1995, after the restoration of democracy in 1990 under the company act 1964. SIAM commercial bank Thailand is the joint venture partner of BOK. Nepalese managers, from the very beginning to till today are managing this bank. In very competitive and small market of Nepalese commercial bank, BOK is struggling for betterment. The SIAM commercial bank diluted its holdings to the Nepalese citizens in 1998. After that Nepalese public holds 97.72% of the equity share of BOK and remaining shares are held by financial institutions (0.9%) and organized institutions (1.38%). Thus, BOK is regarded as the bank of Nepalese promoters. BOK came into operation in March 1995 with the following predominated objectives.

- Identify business prospects not yet catered by there existing commercial banks and offer new banking products and services.
- Introduce modern banking technology facilitating bank and business operations and transactions.
- Accepting deposits and providing loans to industry, commerce, agriculture, as well as home loan and hire purchase loan through its various branches.

The bank is able to earn significant profit. This bank has leading number of shares traded in NEPSE. The market capitalization as on July 16, 2003 of this bank is Rs. 917.89 million.

1.2 Focus of the Study

Most of the financial institutions in Nepal are profit motivated. These organizations survive who can make profit in the long- run. The profit for these organizations is the interest spread between sources and uses of funds. The focus of this study is to examine the influencing factors of interest rate in Nepalese commercial banks taking four

commercial banks as sample. Interest rate is believed as one of the most important factors for the development of financial institutions and financial system as a whole. This study also attempts to analyze the methods used by various financial institutions to calculate the interest. The study is also concentrated on whether the theories on interest rate founded by various economists match in Nepalese context or not. Since interest rate is the main concern of every individual who saves (deposits) and borrows money, it is important to study about interest rate. Therefore, this study focuses on the interest rate of different financial institutions and the central bank's role regarding interest rate.

1.3 Statement of the Problem

Most of the natural resources of Nepal are not being utilized due to the capital inadequacy. Nepal is exporting raw materials instead of producing goods and services from these. If financing is available, many factories could be established to take benefit from utilization of resources that would increase the employment, standard of living and status of country's economy. Financial institutions in Nepal are committed to avail the capital. Different institutions have been established targeting different group. Interest charged and offered by the institutions was regulated by central bank until before few years. Now these institutions are free to fix their interest rate.

In various books of economics and financial institutions, interest occupies a crucial part. While studying of the evolution of interest rate, many theories has been introduced as time spent and changes have taken place in market structure and expectations. Assumptions of these theories were different and different factors were considered as crucial in different time. As a developing country, Nepalese market has not been reached its maturity but in recent years, institutions are determining their interest rate themselves. Thus, it is important to know whether the interest rate is determined by market forces or by managerial discretion. Some of the previous researchers in their thesis had studied in the limited areas such as interest rate structures, impact of interest on portfolio of commercial banks, inflationary aspect of Nepal Rastra Bank, interest rate and lending policy etc. These studies are also very old i.e. of 1980s. This type of study has not been found yet in current scenario.

It seems to be not only public but also university graduates in commerce or business administration cannot calculate the true or effective interest rate. Bankers and other financial institutions use various methods of interest calculation. Correspondingly, true effective rate also differs. Therefore, this researcher has influenced to analyze that what factors affect interest rate and what are the methods used in interest calculation. More specifically this study is an attempt to answer the following questions:

1. What is the impact of liquidity position of organization in interest rate charged and offered by banks and financial institutions in Nepalese market? (Demand and Supply forces).
2. Is the market interest rate affected by inflation?
3. What are various methods the at financial institutions in Nepal use to calculate the interest rate they charged to borrowers? and
4. What are the other major qualitative factors that shape the interest rate in Nepalese financial markets?

1.4 Objectives of the Study

The major objectives of this research are as follows.

1. To know about the effect of different factors on the behavior of interest rate.
2. To analyze whether the interest rate on Nepalese Commercial Banking sector match the established theories or not.
3. To provide some suggestions based on the findings of analysis.

1.5 Significance of the Study

Financial system of the nation performs a number of activities that are essential for a modern private-enterprise economy. Two most important functions that financial system performs consists of providing the means by which payments for transactions are accomplished and savings are accumulated and channeled it to investment users. The financial system determines both the cost of credit and how much credit will be able to pay for the thousands of goods and services we purchase daily. Paying for goods and services, saving, lending, borrowing and investing all activities are carried out within the

frame work of financial system. When credit becomes more costly (that is, higher interest rate) and less available total spending for goods and services falls. As a result unemployment rises and economic growth slows down as business cut back their production. In contrast, when the cost declines (i.e. lower interest rate) and the loanable funds become more readily available, total spending in economy increases, more jobs are created and economic growth accelerates. Hence economic growth depends upon circulation of money and financial system facilitates it.

In modern world, the expenditure of both government and private sectors is increasing. Investment is needed at any stage of economy. But the private sectors, in most of the developing countries including Nepal, are suffering from financial crises. People are less aware about banking system. Financial intermediaries are insufficient to mobilize the saving of the country. Some established institutions are also city based. Small amount of saving is also not utilized in productive investment rather than spending in construction of houses, luxuries goods, ornaments etc. But the question is why the financial institutions of the country could not attract more savings? Are the monetary authorities in this country wrong in determining the rate of interest? Or what the rate of interest can do in this situation? Similarly, the financial institutions of this nation are not being able to lend more. On the other hand, inflation is troubling developing countries like Nepal. Can interest rate play any role in this connection? It is not only without reason that Keynes and modern economists paid special attention to the role of interest rate in the economic field.

Nepalese interest rate varies time to time, region to region and sector to sector. The fluctuation in interest rate is a regular phenomenon in developing countries. So, it is quite necessary to develop some ideas about the impact of interest rate to the economy. Furthermore, it is important to know the policies of financial institutions regarding rate of interest and its impact on various financial aspects of the financial institutions. This study is also considered to be useful to various parties such as further researchers, students, teachers, financial institutions, general individuals etc.

Keeping all these views into consideration the study of interest rate seems worthwhile in the context of Nepal.

1.6 Limitations of the Study

This study is limited by the followings:

- Reliability of study depends upon the reliability of published data and the fairness of the opinion given by respondents.
- As the samples have been drawn at random for convenience there may exist some sampling errors.
- This study covers only 5 fiscal years.
- Although there are other financial institutions like saving and credit co-operatives and other financial NGOs; samples cover only commercial banks.
- Since this study is for the purpose of fulfillment of the 'Masters Degree', stipulated time and resources are also the limitation for the study.
- Only determining factors of interest rates are considered. Impact of interest rate on other aspects has not been studied.

1.7 Organization of the Study

This study has divided in five chapters. Prior to the body of the thesis several pages of preliminary materials such as title page approval sheet, viva sheet, acknowledgements, table of contents, list of figure, list of table, abbreviation used etc have been presented.

Chapter – I Introduction

This chapter is the introduction which contains background of the study, brief history of interest rate in Nepal, focus of the study, statement of problem, objectives of the study, rationale of the study, research hypothesis, organization under study, and limitations of the study.

Chapter – II Review of Literature

This chapter is review of literature, which consists of the review from books journals and thesis.

Chapter – III Research Methodology

It contains research design, population and sample, sources and nature of data, procedure of sampling and data collection, data processing and presentation, and analysis.

Chapter – IV Data Presentation and Analysis

This chapter is presentation and analysis, which contains presentation of data in various ways and its interpretation.

Chapter – V Summary, Conclusion and Recommendations

Last chapter is the summary, conclusion, and recommendation. After the body of the thesis, bibliography and appendices are presented as supplementary materials.

CHAPTER - II

LITERATURE REVIEW

2.1 Introduction

Review of literature is an essential part of all studies. It is a way to discover what other research in this area has uncovered. It is also a way to avoid investing problems (Wolff, & Pant, 2002) that are already been definitely answered. The next step is to develop concepts and ideas about the selected topic by reviewing all the relevant materials regarding the study. In fact, review of literature begins with a search for a suitable topic and continues throughout the duration of the research work. It deals with a literature survey of existing volumes of similar related subjects. Review of literature means reviewing research studies or other related propositions in the related area of the study so that all the past studies, their conclusions and deficiencies may be known and further research can be conducted. It is an integral and mandatory process in research works. The main reason for a full review of research in past is to know the outcomes of those investigations in areas where similar concepts and methodologies had been used successfully.

2.2 Conceptual/Theoretical Review

2.2.1 Meaning of Interest

As we know that interest rate is one of the important variables in economics and finance. Generally, a payment made by a borrower to the lender for the money borrowed and is expressed as a rate percent per year is simply known as interest. But in economics widely different views have been put forth from the time to Aristotle to present day. Aristotle recognized only animal husbandry and stock rising as two legitimate industries whose product could be lent and interest earned on them (Jhingan, 2000).

In economics interest has been defined in a variety of ways. Commonly interest is regarded as the payment for the use or service of capital. If retained by the owner, it can be used by him/her for further production and the additional product he/she gets through

the employment of his capital to someone else; if he/she would have received interest in returns. As Carver said that interest is the income which goes to the owner of capital.

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According to classical economists, it is only by postponing consumption that capital can be created. Since to abstain consumption is disagreeable and painful, for this the lender is paid a reward in the form of interest. Where people abstain consumption they save and thus interest becomes the reward for saving. Saving, however doesn’t involve sacrifice of abstinence on the path of rich. To avoid the fallacy, Marshall substituted the word ‘waiting’ for abstinence and thus interest is than rewarded for waiting.

The Austrians led by John Roe and Bohm Bawerk and followed by Fisher in America considered interest to be the eagion or the premium for time preference. People prefer present to the future and hence they attach more importance to present goods. In order to induce them to postpone enjoyment of goods from the present to the future, they must be compensated in the form of interest. Interest is thus the difference between the present enjoyment and future enjoyment of the same goods.

The neo-classical economists, however, define it as the price for the use of loanable funds. But the modern economists in their effort to avoid these divergent and controversial views about the nature of interest, have explained it in terms of productivity, saving, liquidity preference and money. In other words, interest is simultaneously the reward for the pure yield of capital, for saving, for the foregoing of liquidity and the supply of money.

- **Gross and Pure Interest**

The payment, which the borrower makes to the lender excluding the principal, is gross interest. Net interest is the payment for the use of capital or money only. It is normally the same during a period even in different markets.

- **Reward for Risk Taking**

The lender exposes himself to risk when he/she lends money. Gross interest includes the reward for risk-taking. The greater the risk element the higher will be the rate of gross interest. Unsecured loans are more risky than secured loans and they carry high premium rate i.e. interest rate.

- **Reward for Inconvenience**

When a lender loans money he/she forgoes its use for the duration of the loan. His/her money is locked up and cannot be used for purpose that is more profitable or, if he/she needs this amount for his personal use, he/she will have to undergo the inconvenience of arranging it from some other sources. In fixing the rate of interest, the lender includes in it the reward for such inconvenience.

- **Reward for Management**

The lender has to incure expenditure in keeping proper accounts of the borrowers. He/she buys account books and even maintains staffs. He/she has to remind the borrowers and sometimes has to file a suit for the recovery of loans. The payment that the lender receives form the borrower also includes the expenses for management.

Pure interest is what remains with the lender after deducting the reward for risk-taking, management and inconvenience from gross interest.

2.2.2 Interest Rates as the Allocation Mechanism

In market-based economics, price is the allocating mechanism. When it is the market for allocating savings, interest rates become the price mechanism. Borrowers with unusually productive investment opportunities, as measured in terms of risk and return, can pay

saver a higher income in the form of an interest rate on the savings they borrow than borrowers with less productive investors. The return may also be in the firm of ownership in the business through the common stock of a company.

2.2.3 Functions of the Rate of Interest in the Economy

The rate of interest performs several important roles or functions in the economy:

- It helps guarantee that current savings will flow into investment to promote economic growth.
- It rations the available supply of credit, generally providing loanable funds to those investment projects with the highest expected returns.
- It brings into balance the supply of money with the public's demand for money.
- It is also an important tool of government policy through its influence government maintains control over the volume of saving and investment. If the economy is growing too slowly and unemployment is rising, the government can use this tool to lower interest rates in order to stimulate borrowing and investment and accelerate the production and development. On the other hand, an economy experiencing rapid inflation has traditionally called for a government policy of higher interest rates to slow both borrowing and spending.

2.2.4 Theories on Interest Rate

In the pages of the financial press, "the interest rate" is frequently used. In truth, there is no such thing as "interest rate", for there exist thousands of different interest rates in the financial system. Even securities issued by the same borrowers often carry a variety of interest rates. In this section, we focus upon those basic forces that influence the level of different interest rates.

To uncover these basic rate-determining forces, however we must make a simplifying assumption. We assume, in this section, that there is no fundamental interest rate in the economy known as the pure or risk-free rate of interest, which is a component of all interest rates. The closest approximation to this pure rate in the real world is the market yield on government bonds. It is a rate of return presenting little or no risk of financial

loses to the investor and representing the opportunity cost of holding idle cash, because the investor can always invest in low-risk bonds and earn this minimum rate of return.

Once the pure interest rate is determined, all other interest rates may be determined from it by examining the special characteristics of the securities issued by individual borrowers. For example, only the government can borrow at approximately the pure or risk-free interest rate other borrowers pay higher than this rate due to the higher risk of losses attached to their securities. Difference in liquidity, marketability, and maturity are other important factors causing interest rates to differ from the pure or risk-free rate. First, however, we must examine the forces that determine the pure or risk free interest rate itself. Various theories have been propounded by various economists in different time explaining the pure/risk-free interest rates. All these theories of interest rate include the notion of inflation, i.e., the decrease in purchasing power of money (Johnson, 1999).

Classical theory of Interest Rates

One of the oldest theories concerning the determinants of the pure or risk-free interest rate is the classical theory of interest rate developed during the 18^{th} and 19^{th} centuries by number of British economists and elaborated by Irving Fisher (1930) earlier in this century. The classical theory argues that the rate of interest is determined by two forces: the supply of saving derived mainly from household, and the demand for investment capital coming mainly from the business sector.

Supply of Saving

Saving by Households

Most of the savings in the modern industrialized-economics is carried out by households, i.e., by individuals and family. For these households, saving is simply abstinence from consumption spending. Current saving, therefore, are equal to the difference between current income and current consumption expenditure. Generally, the volume of household savings rise with income. Higher-income families and individuals tend to save more and consume less relative to their total income than families with lower income. Although income level probably dominates saving decision, interest rate also plays an

important role. According to classical theory, a rational individual, it is assumed, will always prefer current consumption of goods and services over future consumption. Therefore, the only way to encourage an individual or family to consume less now and save more is to offer a higher rate of interest on current savings. The classical theory considers the payment of interest a reward for waiting-the postponement of current consumption in favour of greater future consumption. Therefore saving is the function of interest and there is positive relationship between current saving and the interest rate offered on these savings.

Saving by Business

Not only households but also business save money in the form of retained earnings which supplies most of the money for annual investment spending by business firms. The critical element in determining the amount of business savings is the level of business profits. If profits are expected to rise, businesses retain the major part of the profits and borrow less from money and capital market. The result is a reduction in the demand for credit and a tendency toward lower interest rate. On the other hand, when profit fall but firms do not cut back on their investment plans, they are forced to make heavier use of the money and capital markets for investment funds. The demand for credit rise and interest rate may rise as well. Hence, higher interest rate in the money and capital markets typically encourage firms to use internally generated funds more heavily in financing projects. Conversely, lower interest rates encourage greater use of external funds from the money and capital markets.

Saving by Government

Government also saves though, less frequently than households and businesses. In fact, most government saving i.e., a budget surplus, appears to be unintended saving that arises when government receipts unexpectedly exceed the actual amount of expenditure. Income flows in the economy (out of which government tax revenue arise) and the pacing of government spending programs are the dominant factors affecting government savings. Interest rates are probably not a key factor here.

Demand for Investment Funds

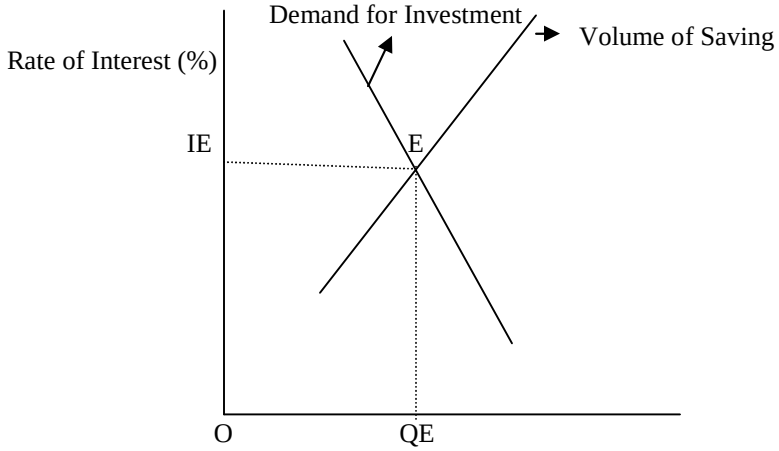
Besides business, households and government savings, the other rate-determining factor is investment spending by business firms. Businesses require huge amounts of funds each year to purchase equipment, machinery, and inventories and to support the construction of new buildings and other physical facilities. The majority of business expenditure for these purposes consists of what economists call replacement investment, that is, expenditures to replace equipment and facilities that are wearing out or are technologically obsolete. A smaller but more dynamic form of business capital spending is labeled net investment expenditure to acquire additional (new) equipment and facilities required to increase output. The sum of replacement investment plus net investment equals gross investment.

The Equilibrium Rate of Interest in the Classical Theory of Interest

The classical economists believe that interest rate in the financial markets were determined by the interplay of the supply of saving and the demand for investment. As shown in present figure, this occurs at point E, where the equilibrium rate of interest is 'IE' and the equilibrium quantity of capital funds traded in the financial market is QE.

Figure 2.1

Equilibrium Rate of Interest in the Classical Theory



(Source: Rose, 1997:213)

The Liquidity Preference Theory of Interest

The classical theory of interest has been called a long term exploration of interest rates because it focuses on the public's thrift habits and the productivity of capital-factors that tend to change slowly. During the 1930s, British economist John Maynard Keynes (1936) developed a short-term theory of the rate of interest that, he argued, was more relevant for policy makers and for explaining near-term changes in interest rates. This theory is known as the liquidity preference theory of interest rates. Interest rate under this theory is determined by the interplay of demand for and supply of liquidity.

The Demand for Liquidity

Keynes argued that the rate of interest is really a payment for the use of scarce resource, money. Business and individuals prefer to hold money for carrying out daily transactions and also as a precaution against future cash needs even though its yield is low or nonexistent. Investors in fixed income-securities, such as corporate and government bonds, frequiently desire to hold money as a heaven against declining security prices. Interest rates, therefore, are the price that must be paid to induce money holder to surrender a perfectly liquid asset and hold other assets that carry more risk. At times the preference for liquidity grows very strong. Unless the government expands the money supply, interest rates will rise.

In the theory of liquidity preference, only two outlets for investor funds are considered: bonds and money (including bank deposits). Money provides perfect liquidity (instant spending power); bonds pay interest but cannot be spent until converted into cash. If interest ratio rise, the market value of loans paying a fixed rate of interest falls; the investor could suffer a capital loss if those bonds were converted into cash. On the other hand, a fall in interest rates results in higher bond prices the bondholder will experience a capital gain if his or her bonds are sold for cash. According to the classical theorists, it is irrational to hold money because it provided little or no return. To Keynes, however, the holding of money could be a perfectly rational act if interest rates were expected to rise, because rising rates can result in substantial losses for investors in bond.

Keynes observed that the public demands money for three different purposes. The *transaction motive* represents the demand for money to purchase goods and services. Some money also must be held as a reserve for future emergencies and to cover extraordinary expenses. This *speculatory motive* arises because we live in a world of uncertainty and cannot predict exactly what expenses or opportunities will arise in the future. Short-term changes in the interest rates were attributed by Keynes to a third motive for holding money-*the speculative motive* that stems from uncertainty about the future prices of bond. Keynes assumed that money demanded for transaction and precautionary purposes is dependent on level of national income, business sales, and prices whereas money demanded for speculative motive is dependent on short-term interest rate. Therefore, the total demand for money in the economy is simply the sum of transactions, precautionary, and speculative demands.

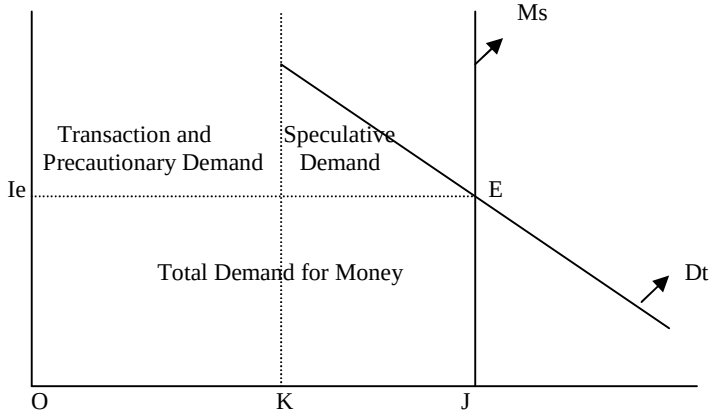
The Supply of Money

Another major element determining interest rates in liquidity preference theory is the supply of money. In modern economics, the money supply is controlled, or at least closely regulated by government. Because government decisions concerning the size of the money supply presumably are guided by the public welfare, not by the level of interest rate, we assume that the supply of money is inelastic with respect to the rate of interest.

The Equilibrium Rate of Interest in Liquidity Preference Theory

Figure 2.2

Equilibrium Rate of Interest in Liquidity Preference Theory



Because the principal determinant of transactions and precautionary demand is income, not interest rates, these money demands are fixed at certain level of national income, i.e., OK in figure. Then any amount of money demanded in excess of OK represents the speculative motive and is rate sensitive. The total demand for money is represented along curve Dt and total supply is represented along JMs curve. Where demand of money equals to supply of money, the equilibrium rate is determined. Point E in the figure is the equilibrium point and Ie is the equilibrium rate. Demand and supply of money are equal to OJ.

The Loanable Funds Theory

A view that overcomes many of the limitations of earlier theories is the loanable fund theory of interest rates. This view argues that the risk-free interest rate is determined by the interplay of two forces: the demand for and supply of credit (i.e., Lonable funds).

The demand for Loanable Fund Consists

Consumer Demand for Loanable Funds

Domestic consumers demand loanable funds to purchase a wide variety of goods and services on credit. The consumer demand for credit is relatively inelastic with respect to the rate of interest. Certainly a rise in interest rate leads to some reduction in the quantity of consumer demand for loanable funds whereas a decline in interest rates stimulates some additional consumer borrowing. However, along the consumer's reality inelastic demand schedule, a substantial change in the rate of interest must occur before the quality of consumer demand for funds changes significantly.

Domestic Business Demand for Loanable Funds

The credit demands of domestic business generally are responsive to changes in the rate of interest than in consumer borrowing. Most business credit is for such investment purposes as the purchase of inventories and new plant and equipment. High interest rates eliminate some profitable investment projectors where as a lower interest rates stimulate investments. Therefore, the quantity of loanable funds demanded by the business sector increases as the rate of interest falls.

Government Demand for Loanable Funds

Government demand for loanable fund is a growing factor in the financial markets but doesn't depend significantly of the level of interest rates. Government decision on spending and borrowing are made in response to social needs and public welfare, not the rate of interest.

Foreign Demand for Loanable Funds

Since the world has become a global village, money can be borrowed and lent across the borders. If interest rate in domestic market is lower than foreign market, foreign demand for loanable funds increases. On the other hand, if interest rate in domestic market is high, foreign demand for loanable funds decreases

Total demand for loanable funds is the sum of domestic consumer's demand, business demand, and government demand plus foreign credit demand. This demand curve slopes downward and to the right with respect to increase in the interest rate.

The Supply of Loanable Funds

Domestic Saving

The supply of domestic savings is the principal source of loanable funds. As noted earlier, most saving is done by households and is simply the difference between current income and current consumption. Business, however, also save, by retaining a portion of current earnings and by adding to their depreciation resources. Government saving, while relatively rare, occurs when current revenues exceed current expenditures. The net effect of income, substitution, and wealth effects leads to a relatively interest-inelastic supply of saving curve. Substantial changes in interest rate usually are required to bring about significant change in the volume of aggregate saving in the economy.

Dishoarding of Money Balances

The public's demand for money (cash balance) varies with interest rates and income levels. The supply of money, on the other hand, is closely controlled by the government. Clearly the two-money demand and money supply-need not be the same. The difference between demand and supply is known as hoarding. While public's demand for cash

balances exceeds the supply, positive hoarding of money takes place as some individuals and business attempt to increase there cash balance at the expense of others. On the other hand, when the publics demand for money is less than the supply available, negative hoarding (dishoarding) occurs. Hoarding reduces the volume of loanable funds available in the financial market whereas dishoarding increases such funds.

Creation of Money by Domestic Banking System

Commercial banks and nonbanking thrifts institutions offering payments accounts have the unique ability to create credit by lending and investing their excess resources. Credit created by domestic banking system represents an additional source of loanable funds.

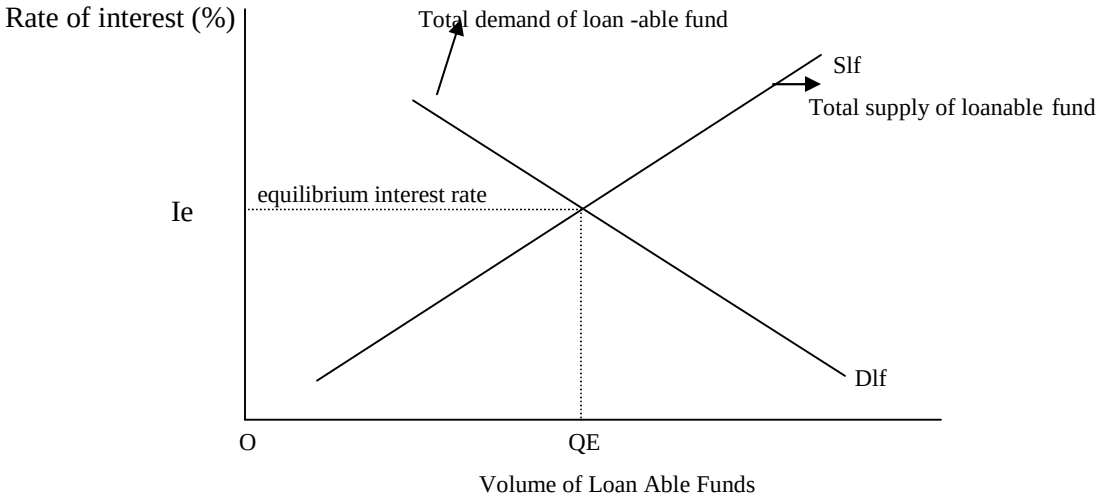
Foreign Lending to Domestic Funds Market

Foreign lender provides large amounts of credit to domestic borrowers. These inflowing loanable funds are particularly sensitive to the difference between domestic interest rate and interest rate in foreign financial market.

The total supply of loanable fund is the sum of domestic saving, dishoarding of cash balance, foreign lending, and new credit created by domestic banking system. The supply curve rise with higher rate of interest, indicating a greater supply of loanable fund will flow into the money and capital markets when the returns from lending increase.

Figure 2.3

Equilibrium Rate of Interest in the Loanable Fund Theory



In above figure, 'DlF' is the total demand curve for loanable funds and 'SIF' is the supply curve of loanable fund. 'e' is the equilibrium rate of interest and 'QE is the equilibrium volume of loanable fund borrowed and demand.

Rational Expectation Theory of Interest

The rational expectation theory assumes that equilibrium interest rate depends upon the changes in investor's expectation regarding future security prices and return. Investor's decision towards the borrowing and lending funds come from the availability of new information. When new information appears about investment, saving or the money supply, investors begin immediately to translate that new information into decisions to borrow and lend funds. So rapid is the process of the market digesting new information that security prices and interest rates presumably impound the new data from virtually the moment they appear. In absence of new information, next period's interest rate will equal to current period's interest rate. In other words, the knowledge of past interest rate will not be a reliable forecast of future interest rate. In a perfectly efficient market, it is impossible to win excess returns continuously by trading on publicly available information.

The important assumptions and conclusions of the rational expectation theory are that 1) the price of securities and interest rates should reflect all available information and the market uses all this information to establish a probability distribution of expected future prices and interest rates; 2) changes in rates and security prices are correlated only with unanticipated, (not anticipated), information; 3) the correlation between rates of return in successive time periods is zero; 4) no unexploited opportunities for profit (above a normal return) can be found in the securities' markets; 5) transaction and storage costs for securities are negligible and information costs are small relative to the value of securities traded; and 6) expectation concerning future security prices and interest rates are formed rationally and efficiently.

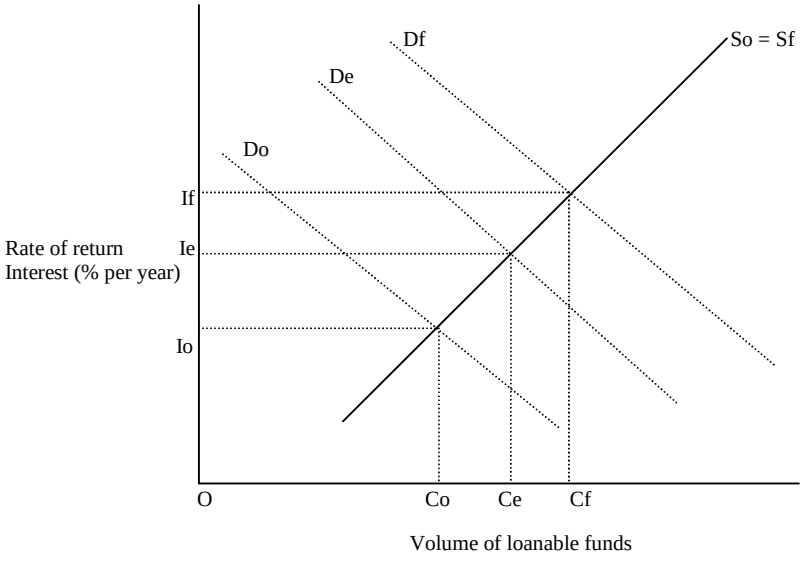
If the money and capital markets are highly efficient in the way we have described, this implies that interest rates will always be at or very near their equilibrium levels. Any

deviation from equilibrium rate dictated by demand and supply forces will be almost instantly eliminates security trader who hope to consistently earn windfall profits from correctly guessing whether interest rates are 'too high' (and therefore will probably rise) are unlikely to be successful in the long run. Interest rates fluctuations around equilibrium are likely to be random and momentary. If market participants were expecting increased demand for credit (with supply unchanged), an unexpected announcement of reduced credit demand implies lower interest rates in the future. Similarly, a market expectation of less credit demand in the future (with supply unchanged), when confronted with an unexpected announcement of higher credit demand; implies that interest rate will rise.

We can illustrate the foregoing points about the rational expectation theory of interest by modifying the loanable funds theory of interest so that its demand and supply schedules reflect not just actual demand and supply but also the expected demand for and supply of loanable funds. The following figure depicts the equilibrium rate of interest under rational expectation theory. 'Do' and 'So' reflect the actual demand and supply of loanable funds in current period, while 'Df' reflects the actual demand for loanable funds that will prevail in the next (future) time period. The supply of loanable funds is assumed to be the same in both time periods, (So = Sf).

Figure 2.4

Equilibrium Interest Rates Under Rational Expectation Theory



Now imagine that during the current period, the government makes an unexpected announcement of its increased need to borrow more money in future period ‘F’ due to an unusually large budget deficit. The result is a new expected demand for loanable funds curve ‘De’, projected to prevail in the next (future) period ‘F’ but as viewed by borrowers and lenders today in time period ‘0’. In this case, the equilibrium interest rate in the current period will not be ‘Io’, but rather ‘Ie’, where the expected demand curve ‘De’ intersects the actual supply curve ‘So’. The equilibrium quantity of loanable funds traded in the current period then will be ‘Ce’ not ‘Co’. This is because, according to the rational expectation theory, borrowers and lenders will act as rational agents, using all the information they posses (including expected events) to price financial assets today. When the future period arrives, the equilibrium interest rate will rise to rate ‘If’ and the quantity of loanable funds traded then will be ‘Df’. The equilibrium rate moves upward because the demand for loanable funds in period ‘F’ is more than the expected future loanable-funds in period ‘F’ is more than the expected further loanable-funds demanded as seen by market participants in period ‘0’.

Suppose, on the other hand, that actual loanable-funds demanded in period ‘F’ increases upward and beyond ‘Do’ but by a smaller amount than was anticipated by investors in the market in period ‘0’. Demand schedule ‘Df’ would then fall somewhere between ‘Do’ and ‘De’. The equilibrium interest (with supply curve unchanged) would be lower than i.e. laying somewhere between ‘Io’ and ‘Ie’.

2.2.5 Interest Rate Movements and Its Relevance

Interest rate movements affect the values of securities, and therefore affect the performance of all types of financial institutions. It is critical for managers of financial institutions (including portfolio managers) to understand why interest rates change, how their movements affect performance, and how to manage according to anticipated movements.

Interest rate movements can affect the values of virtually all securities. They have a direct influence on the market values of debt securities such as money market securities, bond

and mortgages. This is confirmed in the chapters on financial markets, when the main determinants of the market value of each security are identified. Interest rates have an indirect effect on the values of stocks and exchange rates. Since the price movements of derivatives are partially influenced by the price of the underlying instruments, the prices of derivatives representing debt securities or stock or currencies are affected by interest rate movements. Thus, all participants in financial markets closely monitor interest rate movements. So they can restructure their positions in securities to benefit from any expected movements in interest rate (Madura, 2001).

Interest rate movements also affect the value of most financial institutions. Both the cost of funds to depository institutions and the interest received on same loans are affected by interest rate movements. In addition, the market value of securities (such as bonds) held by depository institutions or not-depository institutions are affected as well. Thus, managers of financial institutions closely monitor interest rate movements so they can capitalize on favorable movements or reduce their institutions exposure to unfavorable movements.

2.2.6 Economic Factors that Affect Interest Rates

Although it is useful to identify those who supply or demand loanable funds, it is also necessary to recognize the underlying economic forces that cause a change in the supply of or the demand for loanable funds. The following economic factors influence the demand for or supply of loanable funds and therefore influence interest rates.

2.2.6.1 Impact of Economic Growth on Interest Rates

Assume that as a result of more optimistic economic projections, most business increase their planed expenditures for expansion, which translates into additional borrowing. The aggregate demand schedule would shift outward (to the right). The supply-of-loanable-funds schedule may also shift, but it is more difficult to know how it should shift. It is possible that the increased expansion by business could lead to more income for construction crew and others, who service the expansion. Thus, the quantity of savings, and therefore of loanble funds supplied at any possible interest rate could increase

causing on outward shift in the supply schedule. Yet, there is no assurance that the volume of savings will truly increase. Even if a shift were to occur, it would likely to be of a smaller magnitude than the shift in the demand schedule.

As an example, we can consider how a slowdown in economy would affect the demand and supply schedules of loanable funds and equilibrium interest rate. The demand schedule would shift inward (to the left), reflecting less demand for loanable funds at any possible interest rate. The supply schedule could possibly shift a little, but it is questionable which way it would shift. One could argue that a slowdown should cause increased saving at any possible interest rate as households prepared for the possibility of being laid off. Yet, the gradual reduction in labour income that occurs during an economic slowdown could reduce households' ability to save historical data support this latter expectation. Any shift that did occur would likely be minor relative to the shift in the demand schedule. Therefore, the equilibrium interest rate is expected to decrease.

2.2.6.2 Impact of Inflation on Interest Rates

One of the most serious problems confronting economies around the globe in recent years is inflation. Inflation is defined as a rise in the average level of prices for all goods and services. Some prices of individual goods and services are always rising while others are declining. However, inflation occurs when the average level of all prices in the economy rise. However, inflation occurs when an increase in some general index of price, such as the Consumer Price Index or the broad-based Implicit Gross National Product Deflector, takes place.

There is positive correlation between inflation and interest rate in the market. Since the inflation reduces the purchasing power of consumer (investors), they must be compensated for the decreased purchasing power. Therefore, an increase in inflation leads to increase in quoted market interest rate to maintain purchasing power. This increment in interest rate is known as inflation premium. The Implicit gross National Product Deflector is sometimes referred to as the overall price index since it incorporated

the prices on all subcomponents of the gross national product: consumption, investment, government spending and export.

The fisher Effect

A well known economist Irving Fisher in 1996, has developed a relationship between nominal and real rate of interest. According to Fisher, if expected real interest rate is held fixed, changes in nominal rate will reflect shifting inflation premiums (i.e., changes in the public's view on expected inflation. He argued that the expected real rate of return tends to stable over time because it depends upon the long term factors like productivity of capital, volume of saving in economy etc. in the short term, the nominal interest rate is only influenced by the change in the inflation premium. So, rise in the expected inflation rate causes the same rise in the nominal interest rate.

The Harrod- Keynes Effect of Inflation

Fisher effect of inflation contradicts with the views developed by the British economist Sir Roy Harrod. Harrod's view is based on Keynesian liquidity preference theory of interest. According to him, real rate is affected by the inflation but nominal rate need not to be affected. Under liquidity preference theory, the nominal rate is determined by the demand for and supply of money or funds. Therefore, unless inflation affects either the demand for and supply of money, the nominal rate must remain unchanged whatever may be the expectation of inflation. Harrod argued that a rise in inflationary expectation will lower the real rate of interest.

There is less than one-to-one relationship between changes in expected inflation and nominal interest rates with the inflation caused wealth, income and depreciation effect. That is, a rise in expected inflation reduces the real rate of return to lender and derives the nominal interest rates higher but rise in nominal rate is less than the increase in expected inflation. But according to the inflation-caused income tax effect, if an investor desire to protect (i.e. hold constant) his or her expected real after-tax rate of return, then the nominal rate has to increase by a greater amount than any rise in the expected inflation

rate because otherwise real after tax returns will decline when inflation increases (Rose, 2003: 245).

Impact of price deflation

Deflation tends to force real interest rates higher even as nominal interest rates drop downward zero. These elevated real interest rates tend to slow investment spending and decrease the development of new jobs. Real economic output will decline as factors come to produce less and business profit fall. At the same time lenders gain at a expense of borrowers because the former's purchasing power rises, and business trying to borrow money have to struggle to raise the capital they require to grow and put people back to work.

The price deflation can result in lower output (production) of goods and services, but forces real interest rates upward. However, businesses and the financial system are much better positioned to day deal with moderate deflation, in part because of the development of so many risk management tools (such as financial futures contracts, swaps, and options) (Rose, 2003).

2.2.6.3 Impact of Money Supply on Interest Rates

The central bank can affect the supply of loanable funds by increasing or reducing the total amount of deposit held by commercial banks or their depository institutions. When the central bank increases the money supply, (the loanable funds), which places downward pressure in interest rate. However, if the central bank's actions affect inflationary expectations, this would also increase the demand for loanable funds, which could offset the effect of the increase in the supply of funds. If the central bank (as a monetary authority) reduces the money supply, it reduces the supply of loanable funds. Assuming no change in demand, this action places upward pressure on interest rates (Madura, 2001: 31).

2.2.6.4 Impact of Budget Deficit on Interest Rates

When the government enacts fiscal policies that result in more expenditures than tax revenue, the budget deficit is increased. How an increase in the government deficit would

affect the interest rates, assuming no other changes in habits by consumers and firms occur a higher government deficit increases the quantity of loanable funds demanded at any prevailing interest rate, causing an outward shift in the demand schedule. Assuming no offsetting increase in the supply schedule, interest rate will rise. Given a certain amount of loanale funds supplied to market (though savings), excessive government demand for these funds tend to "crowd out" the private demand (by consumers and corporations) for funds. The government may be willing to pay whatever is necessary to borrow these funds, while the private sector may not. This impact is known as the "crowding-out effect".

There is a counterargument that the supply schedule might shift outward, if the government creates more jobs by spending more funds than it collects from the public (this is what causes the deficit in the first place). If this were to occur, the deficit might not necessarily place upward pressure on interest rates. Much research has investigated this issue (in U.S.A) and, in general, has shown that higher deficits place upward pressure on interest rates.

The increase in public debt refers an increase in the government's demand for loanable funds. However, because other factors can offset this increased demand, the increased demand for loanable funds by the government does not always result in higher interest rates

2.2.7 Term Structure of Interest Rates

The relationship between the rates of return (yields) on financial instruments and their maturity is called the term structure of interest rates (Rose, 1997). This term structure may be presented visually by drawing a yield curve for all securities having the same credit quality. The yield curve considers only the relationship between the maturity or term of a lean or security and its yield at one moment in time (all other influencing factors held constant). For example, we cannot draw a yield curve for securities bearing different degree of credit risk or subject to different tax laws because both risks and tax laws affect relative yields along with maturity.

2.2.7.1 Pure Expectation Theory

According to the pure expectation theory, the term structure of interest rates (as reflected in the shape of the yield curve) is determined solely by expectations of future interest rates to understand how interest rate expectations may influence the yield curve, assuming that the annualized yields of short-term and long-term securities are similar; that is, the yield curve is flat **(**Madura, 2001**)**. Then investors begin to believe that interest rates will rise. They will respond by investing their funds mostly in the short-term so that they can soon reinvest their funds at higher yields after interest rates increase. When investors flood the short-term market and avoid the long-term market, they may cause the yield curve to adjust. The large supply of funds in short-term markets will force annualized yields down. Meanwhile, the reduced supply of long-term funds forces long-term yields up.

Even though the annualized short-term yields become lower than annualized long-term yields, investors in short-term funds are satisfied, because they expect interest rates to rise. They will make up for the lower short-term yield when the short-term securities mature, and they invest at a higher rate (if interest rate rises) at maturity.

Assuming that the borrowers who plan to issue securities also expect interest rates to increase, they would prefer to look in the present interest rate over a long period of time. Thus, borrowers would generally prefer to issue long-term securities rather than short-term securities. This results in a relatively small demand for short-term funds. Consequently, there is downward pressure on the yield of short-term funds. There is also an increase in the demand for long-term funds. Overall the expectations of higher interest rates change the demand for funds and the supply of funds in different maturity markets, which forces the original flat yield curve to pivot upward and become upward slopping.

2.2.7.2 The Liquidity Premium View of the Yield Curve

Security dealers who trade actively in the financial markets frequently argue that other factors besides interest rate expectations also exert a significant impact on the character and shape of the yield curve. Liquidity premium is one of them (Rose, 1997).

Long term securities tend to have more volatile market prices than short-term securities. Therefore, the investors face greater a risk of capital loss when buying long-term financial instruments. This greater risk of less will be important to an investor who is risk averse (not risk neutral as in the expectation theory). To overcome the risk of capital loss, investors must be paid an extra return in the form of an interest rate (term) premium to encourage them to purchase long term financial instruments. This additional rate or yield premium for giving up liquidity (known as the liquidity premium) would tend to give yield curves a bias toward a positive slope. The liquidity premium view does not preclude the important role of interest rate expectations in influencing the shape of the yield curve. Rather, it argues that other factors, such as liquidity, play an important role as well.

Liquidity argument may help explain why yield curves tend to flatten out at the longest maturities. There are obvious differences in liquidity between a 1-year and 10-year bond, but it is not clear that major differences in liquidity exists between a 19-year bond and a 20-year bond, for example. Therefore, the size of the required liquidity (or term) premium may decrease for securities bearing longer maturities.

2.2.7.3 The Segmented-Markets or Hedging-Pressure Argument

A strong challenge to the expectations theory appeared in the 1950s and 1960s in the form of the market segmentation argument or hedging-pressure theory of the term structure of interest rates. The underlying assumptions are that all securities are not perfect substitutes in the mind of investors. Maturity preference exist among some investor groups, and these investors will not stay from their desired maturity range unless induced to do so by higher yields or their favorable terms on longer-or shorter-term securities.

Why would some investors prefer one maturity of security over other? Market segmentation theorists find the answer in a fundamental assumptions concerning investor behavior, especially the investment behavior of financial intermediaries, such as investment companies, pension funds, and banks. These investor groups, it is argued, often act as risk minimizers rather than profit maximizers as assume under the

expectations hypothesis. They prefer to hedge against the risk of fluctuations in the prices and yields of securities by balancing the maturity structure of their assets with the maturity structure of their liabilities. The portfolio strategy reduces the risks of fluctuating income and less of principal.

The existence of maturity preferences among investors groups implies that the financial markets are not one large pool of loanable funds but rather are segmented into a series of submarkets. Thus, the market for securities of medium maturity (5-to10 year securities) attracts different investors groups than the market for longer-term (over 10-year) securities.

The segmented-markets or hedging pressure theory does not rule out the possible influence of expectations in shaping the term structure of interest rates, but it argues that other factors related to maturity-specific demand and supply forces are also important.

2.2.7.4 Preferred Habitat Theory

The Preferred habitat theory of term structure accepts the expectation theory premise of substitution and the segmentation theory premises that substitution is risky for borrowers and savers. However, this theory is not rigid as either of them. Simply but preferred habitat accepts the notion of maturity substitution, but only if the borrowers and savers are compensated with a more favorable interest rate. The additional return to the investor is known as liquidity premium. The preferred habitat theory accepts the expectation theory but claims that the yield curve is not an accurate representation of market expectations. This is because the preferred habitat theory recognizes the existence of a liquidity premium built into the yields for bonds of certain maturities (Thygerson, 1992: 36).

This theory argues that investors seek at their preferred habitat along the scale of varying maturities of securities that matches their risk preferences, tax exposure, liquidity need, regulatory requirements, and planned holding period. Thus, according to the preferred

habitat theory, factors other than expectations alone play a role in shaping the character of the yield curve.

Proponents of preferred habitat argue that investors derive their expectations about future interest rates on the basis of historical experience – the recent trend of interest rates and what history suggests is a "normal" range for rates. In the short-term, the majority of investors expect current interest rate tends to persist into the future; thus, rising interest rates in recent weeks often lead to the expectation that rates will continue to rise in the near term. However, investors generally expect that, given sufficient time (months or years), interest rate will return to their historical average (Rose, 1997: 256).

2.2.8 Specific Risk and Cost Factors Affecting Interest Rates

In the preceding section, we examined the factors that cause the interest rate or yield on one security to be different from the interest rate or yield on another. These factors included the maturity period or term of a loan and expected inflation. In this section, our focus is upon to learn why not one but, in fact, thousands of different interest rates exist in the economy. To analyze yield differentials between securities, therefore, we must understand thoroughly, all the factors that shape interest rates in the money and capital markets.

Marketability

One of the most important considerations for an investor is whether a market exists for those assets he/she would like to acquire. Can an asset be sold quickly, or must the investor wait some time before suitable buyers can be found? This is the question of marketability, and financial instruments vary widely in terms of the ease and speed with which they can be converted into cash. Investors (Lenders) are conscious about the marketability of security and if security is less marketable, they seek compensation for that inconvenience (i.e., waiting for the security to be converted into cash). Therefore, a less marketable security carries higher interest rate while a readily marketable security carries relatively a smaller interest rate. Marketability is positively related to the size (total sale or total assets) and reputation of the institution issuing the securities and to the

number of similar securities outstanding. Marketability is a decided advantage to the security purchaser (lender of funds). In contrast, the issuer of securities in not particularly concerned about any difficulties the purchaser may encounter in the resale (secondary) market unless lack of marketability significantly influences security sales in the primary market.

Liquidity

Marketability is closely related to another feature of financial assets that influences their interest rate or yield: their degree of liquidity. A liquid financial asset is readily marketable. In addition, its price tends to be stable over time and it is reversible, meaning the holder of the asset can usually recover his/her funds upon resale with little risk of loss. Because the liquidity feature of financial assets lowers their risk, liquid assets carry lower interest rates. Inventory strongly interested in maximum profitability try to minimize their holding of liquid assets.

Default Risk

Another important factor causing interest rate to differ one from another is the degree of default risk carried by individual securities. Investor's securities face many different kinds of risk, but one of the most important is default risk – the risk that a borrower will not make all promised payments at the agreed – upon times. All securities except government securities are subject to varying degree of default risk. The yield on a risky security is positively related to the risk of borrower default as perceived by investor's yield on risky security.

Yield on Risky Security = Risk-Free Rate of Interest + Default Risk Premium

The higher the default risk associated with a risky security, the higher the default risk premium on that security and greater the required rate of return (yield) that must be attached to the security as demanded by investors in the market place. Any adverse development, such as a downturn in economy or serious financial difficulties that makes a borrower appear riskier will lead the market to assign a higher default risk premium to

his security. And if risk-free rate remains unchanged, the security's risky yield must rise and its price must decline.

Inflation and Default Risk Premium

We show that inflation can course interest rates to rise as investors in the financial markets demand to be compensated with higher nominal returns when the level of expected inflation or uncertainty about future inflation goes up. However, inflation also appears to affect the size of default-risk premiums on risky securities. Default-risk premiums (often called 'quality spreads') tend to be higher and more volatile when inflation is high and volatile. Greater uncertainty about inflation, as Wheelock (1997) notes, tends to produce a "Flight to qualify" in the financial instruments. This is one of the many ways in which high and volatile price inflation can disrupt the efficient functioning of a market-oriented economy (Rose, 2003).

Call or Prepayment Risk

Many corporate bonds and mortgages, must municipal bonds, and some government bonds issued in today's financial markets carry a call privilege. This provision of bonds contract (indenture) grants the borrower the option to retire all or a portion of a bond issue by buying back the securities in advance of maturity. The call privilege is an advantage to the security issuer because it grants greater financial flexibility and the potential for reducing future interest costs. On the other hand, the call privilege is a distinct disadvantages to the security buyer, who may suffer a decline in expected holding-period yield if the security is called. Therefore, securities that carry a call privilege generally set at lower process and higher interest rates than non callable securities moreover; there is an inverse relationship between the length of the call deferment period and the required rate of interest on callable securities. The longer the period of deferment and, therefore, the longer the investor is protected against early redemption, the lower the interest rate the borrower must pay (Rose, 2003).

Taxability

Taxes imposed by the government have profound effect on the returns earned by investors on financial assets. The income from most securities – interest or dividends and

capital gains – is subject to taxation at the stipulated rate. This tax treatment reduces the investor's real income. Thus the security, the income from which is subject to higher taxation, carries higher rate than the securities, the income from which is subject to lower tax or tax exemption. Therefore, a corporate bond issuer must pay high yield (interest) than a municipal bond.

Servicing Cost

Some financial claims are difficult to service. This means that the process of collecting interest and principal payments, providing accurate records, or monitoring the ongoing credit position of the borrower involves considerable operation cost. Certainly it makes sense that the cost of servicing Rs 10 million of small auto loans is higher than the cost of servicing the same rupees amount of Treasury bonds. The auto loans would involve collection payments and accounting for 800-1200 different loans. The Treasury bonds involve two interest payments per year. Lender must be compensated for the servicing cost. This cost is included in the interest rate charged, and is referred to as the servicing cost (SC) (Thygerson, 1992).

Exchange Rate Risk

As today's financial markets have become more global, there has been a significant growth in the borrowing and investing in foreign denominated financial claims. A U.S. company establishing a manufacturing facility in Nepal might be inclined to issue shares and/or bonds denominated in Nepalese rupees rather than U.S. dollars. Investors also have available to them many investments involve exchange rate risk. This risk relates to the potentiality that the rate of exchange between the domestic currency and foreign denominated currency will change as a result of any numbers of factors. The primary risk for the borrower is that the value of the currency borrowed rises in relation to the domestic currency. This results in an unexpected cost on the international loan, since the loan would have to be repaid in the foreign currency that has risen in value relative to the domestic. This potential change in currency values must be reflected in computing the cost of borrowing. Although it is not possible to accurately forecast future exchange rates, actual forward exchange rates in different countries do reflect differences in interest

rates between countries. These forward exchanges are not good forecasts of the future because they create exchange rate risk for borrowers and investors.

Reinvestment Risk

The reinvestment risk appears generally to all investors that generate cash flows for the investors prior to the maturity of the investment. When the yield to maturity is computed on investments, it is assumed in the calculation process that all cash flows are invested at the yield computed. The internal rate of return (IRR) calculation found in any text book on business finance shows that one of the limitations of the internal rate of return calculation for investments is the assumption that all the cash flows received before the end of the maturity (investment period) are reinvested at the IRR. The reinvestment problem creates reinvestment risk for investors. This is the risk that the cash flows received before the maturity of the investment cannot be reinvested at the yield to maturity of the investment.

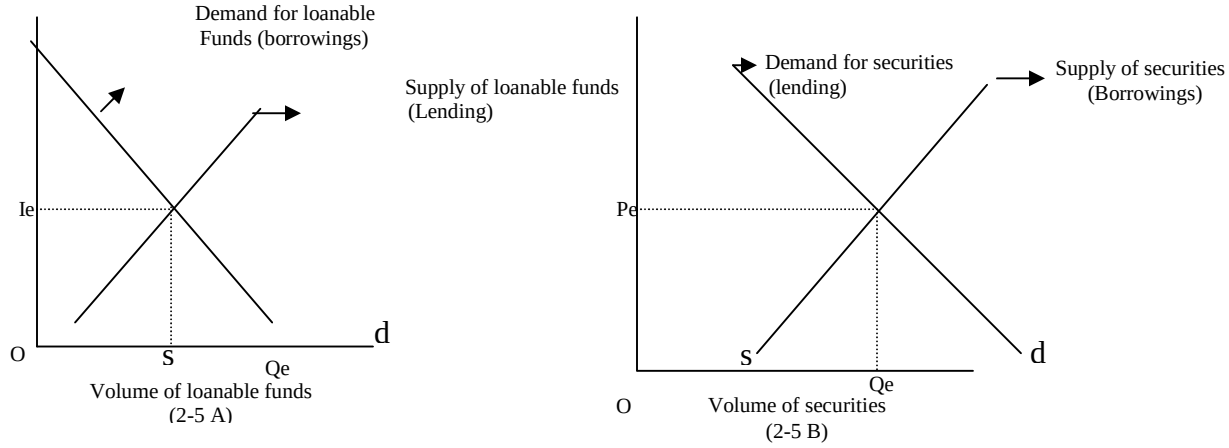
2.2.9 Relationship between Interest Rates and Security Prices

The price of a security and its yield or rate of return is inversely related. A rise in yield implies a decline in price; conversely, a fall in yield is associated with a rise in the security's prices (Rose, 2003: 277).

Investing funds in financial assets can be viewed from two different perspectives, the borrowing and lending of money or the buying and selling of securities. As noted earlier, the equilibrium rate of interest from the lending of funds (borrowers) supply securities to the financial market place, and suppliers of loanable funds (lenders) demand securities as an investment. Therefore, the equilibrium rate of interest or yield on a security and equilibrium price of that security are determined at one and the same instant and are simply different aspects of the same phenomenon, the borrowing and lending of loanable funds.

Figure 2.5

Equilibrium Security Prices and Interest Rates



Presented figure shows demand and supply curves for doth the rate of interest (yield) and the price of securities. The supply of loanable funds curve (representing lending) in the interest rate diagram (2.5A) is analogous to the demand for securities curve (also representing lending) in the price of securities diagram (2.5B). Similarly, the demand for loanable funds curve (representing borrowing) in the interest rate diagram is analogous to the supply of securities curve (also representing borrowing) in the price of securities diagram.

We note in diagram 2.5B that borrowers are assumed to issue a larger volume of securities at a higher price and that lenders will demand more securities at a lower price. In diagram 2.5A, on the other hand, borrowers demand a smaller quantity of loanable funds at a higher interest rate, while lenders supply fewer loanable funds at a lower interest rate (yield). The equilibrium interest rate (yield) in figure 2-5A is determined at point 'Ie', where the demand for and supply of loanable are equal. Similarly, in figure 2-5B, the equilibrium price for securities lies at point 'Pe', where the demand for and supply of securities are equal. Only at the equilibrium interest rate and a equilibrium security price will both borrowers and lenders be content with the volume of lending and borrowing taking place within the financial system.

2.2.10 How Open Market Operations Affect Interest Rates

Even though most interest rates are market determined the central bank has considerable authority and powerful mechanisms to affect the level of interest rates by controlling the supply of loanable funds. The primary tool is open market operation. Through open market operation, the central bank purchases or sells securities. These are primarily treasury securities. When central bank purchases the securities it adds to the supply of loanable funds. The sellers of the securities the central bank purchased can reinvest in other loans and investments. When the central bank sells securities, the opposite occurs (Thygerson, 1992: 81).

When the central bank uses open market operation to increase bank funds, banks have more funds that can be loaned out. This can influence various market determined interest rates. First, the interest rate on loans between banks may decline as some banks have a larger supply of excess funds to lend out. Second, banks with excess funds may offer new loans at lower interest rates in order to make use of these funds. Third, these banks may also lower interest rates offered on deposits because they have more than adequate funds to conduct existing operations (Madura, 2001:81).

As bank deposit rates decline household with available fund may search for alternative investments such as treasury securities or other debt securities, the yield will decline. Thus open market operation used to increase bank funds influence not only bank deposits and loan rates but the yields on other debt securities as well. The reduction in yields on debt securities lowers the cost of borrowing for the issuers of new debt securities. This can encourage potential borrower (including corporations and individuals) to borrow and make expenditures that they might not have made if interest rates were higher.

If open market operation is used to reduce banks' fund by selling the treasury securities; by increasing the level of discount rate; and by increasing the reserve requirements; the opposite effect occurs. More banks have different funds and fewer banks have any excess funds. Thus there is upward pressure on the interest rate offered to bank deposits. As bank deposit rate rises, some investors may be encouraged to create bank depositors

rather than invest in other debt securities thereby increasing the yield offered on the instruments.

The actions of the central bank also affect the level of aggregate employment and inflation. The central bank tends to foster stimulative open-market policies when the economy has slack resources and high unemployment, and restrictive policies during period low unemployment and rising inflation.

2.2.11 Interest Rates Charged by Institutional Lenders

Institutional lender of fund – banks, credit unions, insurance companies, and finance companies – often employ different methods to calculate the rate of the interest charged on their loans. Four commonly used methods used for calculating institutional loan rate are presented here.

A. The Simple Interest Method/Collect Method

If the interest is paid at the maturity of a loan, the stated rate of interest is the effective rate of interest (Weston & Copeland, 1992: 847). Both the amounts of interest and principal are paid at the end of maturity period of loan, under this method.

Effective Interest Rate = Interest Amount / Amount Borrowed

B. Discount Method

Many commercial loans, especially those used to raise working capital, are extended on a discount basis. This so-called discount method for calculation loan rates determines the total interest charge to the customer on the basis of the amount to be repaid. However, the borrower receives as proceeds of the loan only the difference between the total amount owed and the interest bill (Rose, 1997: 231).

Effective Interest Rate = Interest Paid / Net Loan Proceeds

C. Add on Installment Rate of Interest

A method for calculating loan interest rates often used by finance companies and banks is the add-on rate approach. In this instance, interest is calculated on the full principal of the loan, and the sum of interest and principal is divided by the number of payments to determine the rupee amount of each payments. The effective interest rate can be found from following equation by solving for r.

Borrowed Amount = Periodic Payments × PVIFA r% n periods.

N= Number of Payments,

r = Stated Interest Rated / Number of Payments

PVIFA= Present Value Interest Factor for an Annuity

D. Regular Installment

In this method of interest calculation, equal periodic installments are determined by dividing the total amount of loan by present value of interest factors for an annuity at the stated rate. These periodic amounts of payments include both the interest and some part of principal. In this method interest is calculated only on remaining balance of principal. Effective interest rate can be found by solving for r in the following equation.

Loan Amount = Periodic Payment (PVIFA r, n)

r = Stated Rate/Number of Payments

n = Total Number of Payments

2.3 Review of Relevant Studies

2.3.1 Review of Unpublished Thesis

No thesis on this topic can be found in various libraries of Tribhuvan University. But some studies have been conducted as thesis for the partial fulfillment of M.A. and MBA in T.U., which are related, to some extent, to this topic, are reviewed here.

Neupane (1997) entitled "*Money, Interest rates,* and *Financial Development in Nepal*" found that interest rate is one of the most important devices for resource mobilization and

interest rate plays a major role in the financial development of Nepal. He viewed that institutional interest rates are lower in our country. This caused implances between credit demanded and supplied. This fact derived proper people from getting enough credit facilities. On the other hand, commercial banks are providing credit facilities only for trade and commercial purposes. Finally he makes the conclusion that to mobilize the resources and to divert them in to productive work; institutional interest rate should be made higher.

Rajbhandary (1978) entitled *"The Interest rate Structure of Commercial Banks in Nepal"*. The objective of his study was to show the relation of interest rate with saving and fixed deposits; with loans and advances; and with interest earning (i.e. interest received on loan minus interest paid on deposits).

His analysis concludes that the time deposits are positively and significantly correlated with the interest rates. There is significant correlation between the saving deposits and the rate of interest. Fixed deposit is more sensitive to the interest rate revision done by NRB. The correlation between the growth of fixed deposits and the interest rate particularly from 1974 to 1977 is most significant. But the relation between the interest rates and the loan and advances is less significant. Among all the sectors, the private sector seems most sensitive to interest rate change. Most of the loans too correlated positively if absolute cumulative figures are taken. But the growth rate of total loans and advances except investment on HMG securities is negatively correlated more with the weighted average rate of interest since 1973. The growth of loans to private sector is also negatively correlated with interest rate since 1971. Negative correlation between loans and interest rate meant that loans decrease at higher interest rate and vice versa.

The net interest earning is depended upon interest coverage. The total interest received and the total interest paid significantly correlated in the case of both of the banks i.e. Nepal Bank Limited and Rastriya Banizya Bank, the sample organizations of the study. He is in view that NRB can well monitor the credit flow and profits of the commercial banks in Nepal by manipulating the rates of interest. It can also manipulate the demand for and supply of money.

Pandey (1979) entitled *"Money Supply, Level of Prices and Interest Rate Structure"* taking objective to show the relationship among money supply, price level and interest rate structure. She has analyzed the factor affecting money supply and price level. But she has explained the interest-rate-history showing what NRB had done to interest rate rather than showing the relationship of interest with price level and money supply. It might be relevant because interest rate, at that time, was fully controlled by NRB.

Shrestha (1979) upon the title of *"Interest Rate and its Impact upon Resource Mobilization and Utilization"* is also seems relevant to review here. Since his study is too old, interest rate at that time was purely the central bank's phenomenon. He, in his study, has concluded that the frequent change in interest rates was disliked by customers except changing the interest rates as directed by NRB. Shrestha has suggested that the commercial banks to quote stable rate as far as possible. He also recommended that the method of calculating interest should be used in such a way that the previous customers and depositors who are already involved in banking transaction should not be affected adversely. He also suggested to charge high interest rate on loan to luxury goods as in unproductive sectors and a lower rate on productive and small scale industries.

Kshetry (1980) was conducted a study titled *"Interest Rate Structure and its Relation with Deposits Inflation and Credit in Nepal"*. The objective of his study was to show the relationship between interest rate and other economic variables like deposit, inflation and credit flow. His study concludes the followings:

1. Keeping other variables constant, the institutional interest rate is the important explanatory variable to influence the volume of deposits in Nepal. This means that the upward movement in the interest rate on deposit increases the volume of deposit.
2. The relationship between income and interest rate and between inflation and interest rate could not come significant.
3. He found that the price level of Nepal is linked with Indian prices and also found very high inflation (10-17%) during his study period.
4. He also found out the negative relationship between credit flow and loan rate.

His suggestion to commercial banks is to fix the concessional interest rate in order to promote the cottage and small scale industries; and to monetarists to consider the rate of inflation while determining the interest rate on deposits.

Bhoosal (1995) entitled *"An Analysis of Causes of Inflation in Nepal"*. He has shown the relationship of inflation with various factors such as growth rate, income level, cost of holding money, Indian inflation and price level, deficit financing, but he failed to show the relationship between interest rate and inflation.

Bhandari (1978) entitled *"The Impact of Interest Rate Structure on Investment Portfolio of Commercial Banks of Nepal"*, has concluded followings:

1. Rates of commercial Banks have been fluctuating. Deposits and lending rates were increased immediately after liberalization of the interest rate on August 31, 1989 but, however, started to decline which have helped in increasing the credit flow.
2. Interest rate structure has direct influence on profitability of commercial banks. Decreasing lending rate helps to increase the profitability through increasing the credit.
3. Deposits are more interest rate conscious and positively co-related.
4. Loans and advances of commercial banks have been found to be continuously increasing with the decline in interest rates.
5. Effective interest rate structure helps in proper utilization of resources as measured by loan to deposit ratio.
6. Most of the banks are having similar interest rate structure which lessens the importance of liberalization of interest rate.

Dongol (2003) on the *"Impact of Interest Rate on Financial Performance of Commercial Banks"* concludes:

1. Most of the commercial banks contradict the general financial theories.
2. The relation between amount of deposit and interest rate on deposit, in general concept, must be positive. But deposits are increasing despite the decrease in the

general level of interest. The result of such phenomenon is that there are fewer investment opportunities for the banking sector as well as general investors.

3. The relation between total amount of loan and the lending rate is negative and significant. However, the change in the total amount of loan flow is not proportionate with the change in the lending rate.
4. Correlation between interest rate and inflation is not significant.
5. Not only interest rate is responsible to shape the profitability of banks but also the operating efficiency also has major influence on it.

2.4 Research Gap

This study includes the variables like deposit amount, interest rate of deposit, amount of loan, lending rate, inflation and risk free rate and their relationship of four commercial banks (HBL, NABIL, NBBL and BOK). I want to prove that this research is an original of interest rate of Nepalese Banking and financing sector. The researchers are requested to research about the different factors influencing interest rate like maturity period, open border with India, political instability etc.

Our study is different than other's study due to following reasons.

1. I have researched the Commercial Banks only.
2. No current thesis is available in interest rate of commercial banks as on date.
3. This study includes the very recent information of NRB.
4. It shows current interest rate and deposit policy applied by sampled financial institution.
5. The study particularly shows how these companies are growing despite of critical market situation.
6. The study incorporates the latest technology (fully computerized) adopted by these financial institutions.

CHAPTER - III

REEARCH METHODOLOGY

3.1 Introduction

Research methodology is a systematic way to solve the research problem. In other words, research methodology describes the methods and process applied in the entire aspect of the study. Research methodology refers to the various sequential steps (along with a rational of each step) to be adopted by a researcher in studying a problem with certain objectives in view. Thus the overall approach to the research is presented in this chapter. This chapter consists of research design, sample size and selection process, data collection procedure and data processing techniques and tools.

3.2 Research Design

A research design is the specification of methods and procedures for acquiring the information needed. It is the overall operational pattern of framework for the project that stipulates what information is to be collected from which sources and by what procedures. The research design followed for this study is historical, analytical and descriptive. To determine the effect of inflation and liquidity on interest rate, historical data are analyzed and the research design followed is also analytical. For some qualitative interest rate influencing factors, the research design is descriptive as per the objectives of the study.

3.3 Population and Sample

Since the research topic is about interest rate, all the Commercial Banks of Nepal are the members of population of the study. The population for the study comprises 26 commercial banks. Out of them four commercial banks are taken as sample on the base of partial foreign investment, to draw the conclusion about population. The main objective of selecting joint-venture banks is to identify the foreign policy in interest rate.

Organizations under study are as follows whose brief introduction is presented in chapter one.

3.4 Sources and Nature of Data

This study mainly based on secondary data. To show the relation between variables involved secondary data are used. The sources of secondary data have been collected from published annual reports, published bulletins and prospects of concerned organizations, various publications of Nepal Rastra Bank, various theses and various papers, journals, magazines and websites.

3.5 Data Collection Procedure/ Technique

Secondary data on annual reports of concerning organizations, interest rate structure of such organizations and introductory profiles of the institutions are collected by visiting the respective organizations and from their web sites. Some secondary data of sample organizations and Nepal Rastra Bank's regulation upon them are collected from the central office of NRB, Baluwatar.

3.6 Data Processing and Presentation

Data collected for the study are presented in various forms. Most of the secondary data are presented in tabular form and some graphical presentation is also used. Since the primary data collected are more subjective they are presented in tables and graphs and conclusions have been drawn. So far as the computation is concerned; it has been done with the help of scientific calculator and computer software Programme.

3.7 Data Analysis Tools

There are two techniques to determine the data

a. Financial Tools
b. Statistical Tools

Statistical tools-

a. Correlation
b. Co-efficient of multiple determinations
c. T-Test
d. Graphical Approach

No financial tools are applied

A) Correlation

Correlation analysis is the statistical tool that we can use to describe the degree to which one variable is linearly related to other variables. Two or more variables are said to be correlated if change in the value of one variable appears to be related or linked with the change in the other variable. The measure of correlation, called correlation coefficient summarizes, in one figure, the degree and direction of correlation. The correlation analysis refers the closeness of the relationship between the variables. Correlation may be positive or negative and ranges from -1 to +1. Simple correlation between inflation and interest rate and between liquidity and interest rate is determined in this study. Similarly multiple correlation coefficients between above mentioned variables also has been determined assuming interest rate is dependent and other two variables are independent.

Simple Correlation coefficient (r) = $$r = \frac{n \sum X_1 X_2 - (\sum X_1)(\sum X_2)}{\sqrt{n \sum X_1^2 - (\sum X_1)^2}\sqrt{n \sum X_2^2 - (\sum X_2)^2}}$$

$$r = \frac{Cov(X_1, X_2)}{Var X_1, Var X_2} \qquad \text{Or,}$$

$$Covariance(X_1, X_2) = \frac{1}{n} \sum (X_1 - \overline{X_2})(X_2 - \overline{X_2})$$

where;

n = total number of observations

X_1 and X_2 = two variables, correlation between which is calculated

Multiple Correlation Coefficient $f R_{1.23} = \sqrt{\frac{r_{12}^2 + r_{13}^2 - 2r_{12}r_{13}r_{23}}{1 - r_{23}^2}}$

Where, r_{12}= correlation coefficient between variable one and two

r_{13}= correlation coefficient between variable one and three

r_{23}= correlation coefficient between variable two and three

B) Coefficient of Multiple Determinations

The square of multiple correlation coefficients is called coefficient of multiple determination and it is very useful in interpreting the value of multiple correlation coefficient. The main significance of the multiple determinations is to represent the proportion of total variations in the dependent variable which is explained by the variations in the two independent variables.

Coefficient of Multiple Determination = $R^2_{1.23}$

C) T-test for Significance of Correlation Coefficient

If 'r' is the observed sample correlation coefficient of 'n' pairs of observations from bivarite normal population, the test statistics for significance of correlation under null hypothesis is given by:

$$t = \frac{r}{\sqrt{1 - r^2}} \sqrt{n - 2}$$

i.e. t follows t-distribution with n-2 degree of freedom (d.f.), 'n' being the sample. Confidence limit for estimating population correlation coefficient (ρ)

$1 - \sim$ % confidence limits for estimating population correlation coefficient (ρ) are given by:

$r \pm t_{\sim} f(n - 2) \cdot S.E.(r)$

$= r \pm t_{\sim} (n - 2) \sqrt{\frac{1 - r^2}{n}}$

t_a = *Level of significance*

D**) Graphical Approach**

All the necessary information and data can be shown in figures. We can use Trend Line and Bar Diagrams where necessary.

3.8 Research Hypothesis

A quantitative statement about population parameter is called a hypothesis. In other words, it is an assumption that is made about the population parameter and then its validity is tested. It may or may not be found valid in verification. The act of verification involves testing the validity of such assumptions which, when undertaken on the basis of sample evidence, is called statistical hypothesis or testing of hypothesis. The main goal of testing hypothesis is to test the characteristics of hypothesized population parameter based on sample information whether the difference between the population parameter and sample statistics is significant or not.

The hypotheses formulated for this study are as follows:

1. First hypothesis is related to the significance of the correlation coefficient between liquidity (supply or deposits) and interest rate.

Null hypothesis, Ho: $\rho=0$ i.e., population correlation coefficient is zero. In other words, the variables (amount deposited and interest rate) in Nepalese financial market are not correlated.

Alternative hypothesis, H_1: $\rho \neq 0$ i.e., population correlation coefficient is not equal to zero. In other words, the variables in population (amount deposited and market interest rate) on deposit are correlated.

2. Second hypothesis is related to the significance of the correlation coefficient between loan demand (amount loaned) and lending rate.

Null hypothesis, Ho: $\rho =0$ i.e., population correlation coefficient is zero which means that the variables in population i.e. amount loaned and lending rates in Nepalese financial market are not correlated.

Alternative hypothesis, $H_1 \neq 0$ i.e., population correlation coefficient is not equal to zero. In other words, amount loaned and lending rates are in Nepalese financial market correlated.

3. Third hypothesis is related to the test of significance of the correlation coefficient between interest rate on deposit and lending.

Null hypothesis, Ho: $\rho = 0$ i.e., there exist correlation between interest rate on deposit and lending in Nepalese financial market.
Alternative hypothesis, H_1: $\rho \neq 0$ i.e., there does not exist correlation between interest rate on deposit and lending in Nepalese financial market.

4. Fourth hypothesis is related to the test of significance of the correlation coefficient between inflation rate and interest rate on deposit.

Null hypothesis, Ho: $\rho = 0$ i.e., population correlation coefficient is zero which means that the variables in population (inflation rate and interest rate on deposit) in Nepalese financial market are not correlated.

Alternative hypothesis, H_1: $\rho \neq 0$ i.e., population correlation coefficient between inflation and interest on deposit in Nepalese financial market are correlated.

5. Fifth hypothesis is related to the test of significance of the correlation coefficient between inflation and lending rate.

Null Hypothesis, Ho: $\rho = 0$, i.e., population correlation coefficient is zero which means that variables in population (inflation and lending rate) in Nepalese financial market are not correlated.

Alternative hypothesis, H_1: $\rho \neq 0$, i.e., population correlation coefficient is not equal to zero that means variables in population i.e., inflation and lending rate in Nepalese financial market are correlated.

6. Sixth hypothesis is related to the test significance of the correlation coefficient between interest rate and risk-free rate of interest.

Null Hypothesis, Ho: $\rho = 0$, i.e., the interest rate on deposit and risk-free rate of interest in Nepalese financial market are not correlated.

Alternative hypothesis, H_1: $\rho \neq 0$, i.e., the interest rate on deposit and risk-free rate of interest in Nepalese financial market are correlated.

Null Hypothesis, Ho: $\rho = 0$, i.e., the interest rate on lending and risk-free rate of interest in Nepalese financial market are not correlated.

Alternative hypothesis, H_1: $\rho \neq 0$, i.e., the interest rate on lending and risk-free rate of interest in Nepalese financial market are correlated.

CHAPTER - IV

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter is the main body of the study which includes detail analysis and interpretation of data relating to interest rate on deposit and lending, deposit collection, and loan advance of each selected organizations from Nepalese financial system. Relations between variables i.e. between interest on deposit and deposit collected; between interest rate on loan disbursed; and between interest rate on deposit and interest rate on lending have been observed, analyzed and interpreted. To show the response of interest rate toward inflation rate and real rate of interest, correlation between these variables has been analyzed. The data and information gathered from the different sources, as described in previous chapter, have been broadly grouped into the following two groups.

- For the quantitative analysis, various published data from NRB and concerned organizations' publications have been analyzed for showing their relationship.
- For qualitative analysis by using various published data from NRB and sample organizations and by using NRB websites have been presented and analyzed.
- Different tables and diagrams have been use to make the result clearly understandable.

4.2 Quantitative Analysis (Correlation Analysis)

If two or more quantities vary in sympathy so that movements in one trend to be accompanied by corresponding movements in the other(s), then they are said to be correlated. Thus, the correlation analysis is generally used to describe the degree to which one variable is related to another. It helps to identify whether a positive or a negative relationship exists; the relation is significant or not; and to establish cause and effect relationship. The correlation analysis, a statistical tool, has been used here to show the relationship between various variables assumed to be influencing factors of interest rate charged and offered by sample institutions. Multiple correlation has also been computed

to show the simultaneous effect of two factors on interest rate. The coefficient of correlation is also tested using t-statistics of hypothesis to show whether it is statistically significant or not. Detail analysis of individual institution has presented in coming sections.

4.2.1 Himalayan Bank Limited (HBL)

Table 4.1

Himalayan Bank Limited

Fiscal Year	Deposit Amount (Rs. in million) 'a'	Interest Rate on Deposit 'b'	Loan amount (Rs. In million)'c'	Interest rate on Lending 'd'	Inflation rate 'e'	Risk-free rate 'f'
2005	24831.15	2.87	13245.06	9.12	4.5	2.46
2006	26456.31	2.69	15515.71	8.95	8.0	2.84
2007	29905.94	2.69	17672.01	7.3	6.4	2.42
2008	31805.31	3.22	19985.19	7.99	7.7	4.22
2009	34680.96	4.31	25292.07	8.41	12.9	5.44

Source: - Annual Reports of HBL and Various Bank and Financial Statistics Published by NRB

Table 4.1 depecits the total amount deposited ; average interest offfered on such deposits; total amount loaned; interest rate charged on such lending of HBL for five ficscal years covering from FY 2004/2005 to 2008/2009. Table 4-1 also contains the inflation rate and risk-free rate (91 days treasury bill rate) for the same fiscal years. The correlation coefficient between interest rate and other varibles are presented in table 4.2. Lower part of table 4.2 contains the multiple correlation coefficient and coefficient of multiple determination. The correlation coefficeint between interest rate on deposits and amount of deposit (r_{ab}) is 0.4271. This means that these two variables are positively correlated. The change in deposit amount leads the change in the interest rate on deposit in same direction but in small proportion. When supply of loan able fund (deposit amount) increase, interest rate on such deposit also increase. In other words we can say that higher interest rate on deposit attracts more deposit.

The coefficient of determination between these two variables, $r^2_{ab,}$ is 0.1824 which means that 18.24 percent of total variation in deposit amount has been explained by dependent variable i.e. interest rate on deposit and remaining is due to the effect of other factors in the economy. t-statistics for the testing the significance of the correlation is 0.82. Since the tabulated t-value at 5 percent level of significance for 4 degree of freedom (2.77) is more than the calculated value, correlation coefficient is insignificant. This means that the variables mentioned (interest rate on deposit and amount deposited) of HBL are not significantly correlated which means that interest rate on deposit of HBL is not correlated with amount deposited and movement in deposited amount does not affect the interest rate on deposit significantly.

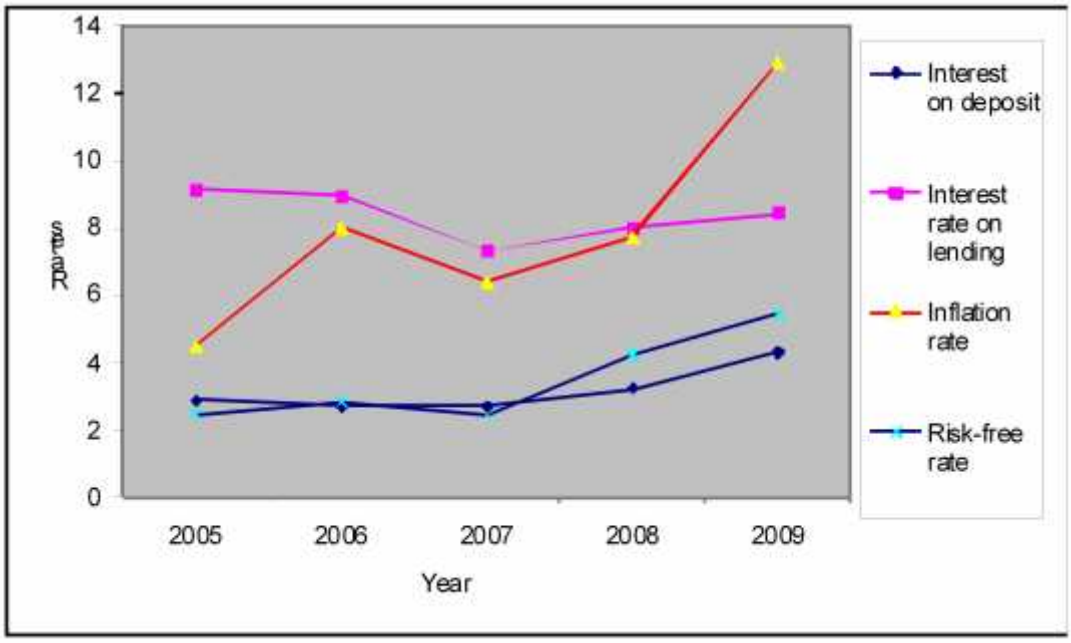
Table 4.2

Correlation Analysis HBL

Variables	**Coefficient of Correlation**	**Coefficient of Determination**	**t-statistics**	**Table value**	**Remarks**
r_{ab}	0.4271	0.1824	0.82	2.77	Insignificant
r_{bd}	0.0177	0.0003	0.031	2.77	Insignificant
r_{cd}	-0.3724	0.1387	0.69	277	Insignificant
r_{be}	0.8702	0.7572	3.06	2.77	Significant
r_{bf}	0.9449	0.8928	4.99	2.77	Significant
r_{de}	-0.0662	0.0044	0.115	2.77	Insignificant
r_{df}	-0.0525	0.0028	0.091	2.77	Insignificant
Multiple Correlation Coefficient		$R_{b.ad} = 0.5265$	**Coefficient of Multiple Determination**		$R^2_{b.ad} = 0.2772$
		$R_{d.bc} = 0.7875$			$R^2_{d.bc} = 0.6202$
		$R_{b.ef} = 0.9466$			$R^2_{b.ef} = 0.8961$
		$R_{d.ef} = 0.0670$			$R^2_{d.ef} = 0.0045$

Figure 4.1

Relationship between Rates of HBL



The correlation coefficient between interest rate on lending and amount of loan-advanced, r_{cd} , has been found negative (-0.3724) which means the variables are negatively correlated. According to the assumption of the study interest rate is dependent and there should be a positive correlation between these two variables which means that increased demand of loanable fund also causes increment in the interest rate. But this negative correlation of coefficient between these variables tells that more loan (funds) is demanded at lower rate i.e. demand is dependent on interest rate. The coefficient of determination, $r^2_{cd,}$ of 0.1387 means that 13.87 percent of total variation in amount loaned has been explained by the variation in interest rate on lending and remaining is the effect of other factors. T-value for testing the significance of the correlation coefficient is 0.69, which is less than table value of 2.77, so the correlation coefficient is insignificant. Therefore, it can be concluded that the changes or movement on amount loaned doesn't have any impact on interest rate on lending but theoretically there should be positive correlation between two variables and significantly correlated.

Similarly, the correlation coefficient between interest rate on lending and interest rate on deposit, $r_{bd,}$ is 0.0177, which means that these two variables are not correlated. In general these two variables should be highly positive correlated. The coefficient of determination between these variables, $r^2_{bd,}$ is 0.0003, which means that almost total variation in dependent variable (interest rate on lending) has been explained by the other variables in the economy. The coefficient of determination is not according to our theory it may be due to instable political condition. Test statistics for testing the significance of the correlation coefficient is 0.031 which is less than tabulated value. Since the calculated t-value is less than tabulated value at 5 percent level of significance for 4 degree of freedom (2.77) the correlation coefficient is insignificant which means that interest rate on deposit and that on lending of HBL are not significantly correlated and movement in interest rate on deposit doesn't affect in the movement in interest rate on lending.

Another variable in economy that affects interest rate is the inflation. The correlation coefficient between interest rate on deposit and inflation rate, $r_{be,}$ is 0.8702 which means that these two variables are positively correlated. An increment in inflation brings increment in interest rate on deposit and vice versa. In general concept also, there is positive correlation between these variables. The coefficient of determination, $r^2_{be,}$ of 0.7572 means that, of the total variation in dependent variable (interest rate on deposit); 75.72% has been explained by the variation in independent variable (inflation rate). t-value for testing the significance of the correlation coefficient is 3.06 which is less than the tabulated t-value for the 5 degree of freedom at 4 percent level of significance, 2.77. Since, the calculated value is greater than table value the correlation coefficient is significant which means that interest rate on deposit of HBL is highly correlated with the inflation rate and movement in inflation rate affect the interest rate on deposit significantly.

Another variable in the economy that is considered to be affecting factor of interest rate in financial market is the risk-free rate. The correlation coefficient between interest rate on deposit of HBL and the risk-free rate (rate on 91 days treasury bill), $r_{bf,}$ is 0.9449 which shows that the variables are highly positively correlated. The change in risk-free

leads the change in the interest rate in same direction. The coefficient of determination r^2_{bf} is 0.8928 which means that 89.28 percent of total variation in interest on deposit is due to the effect of the variation in independent variable (risk-free rate) and remaining is the effect of other factors. The t-value for testing the significance of the correlation coefficient is 4.99 which is greater than the table value for 4 degree of freedom at 5 percent level of significance, 2.77. From this it is revealed that interest rate on deposit of HBL is significantly correlated with the risk-free rate and risk-free rate highly affect interest rate on deposit of HBL significantly.

Similarly, the relationship of interest rate on lending of HBL with inflation has also been examined. The coefficient of correlation between inflation and interest rate on lending, $r_{de,}$ is -0.0662 which shows that the variables are negatively correlated but in small proportion. The coefficient of determination between these variables, $r^2_{de,}$ is 0.0044, which means that almost total variation in dependent variable (interest rate on lending) has been explained by other factors. The t-value for testing the significance of correlation coefficient is 0.115. Since, the calculated t-value is greater than the tabulated t-value for 4 degree of freedom at 5 percent level of significance 2.77; the variables are not correlated significantly. This means that the lending rate of HBL is not significantly correlated with the inflation rate.

The effect of risk-free rate of interest on interest rate on lending of HBL has also been examined through the analysis of correlation between these variables. The coefficient of correlation between these variables, $r_{df,}$ is -0.0525. This means that there is negative relationship between these variables but in small proportion. In general, interest rate is dependent on risk-free rate; the variation in risk-free rate brings the variation in interest rate on lending in the same direction. But these two variables are negatively correlated. The coefficient of determination between variables is 0.0028 which indicates that almost total variation in interest rate on lending is explained by the variation in other factors. The t-value for testing the significance of the correlation coefficient is 0.091. Since, the calculated t-value is smaller than table value at 5 percent level of significance for 4

degree of freedom (2.77), the correlation coefficient is not significant. This means that the interest rate on lending of HBL is not significantly affected by the risk-free rate.

To examine the combined effect of two factors on interest at once, multiple correlation coefficient has also been computed. The multiple correlation coefficient taking interest rate on deposit as dependent and amount deposited and interest rate on lending as independent, $R_{b.ad,}$ is 0.5265. The coefficient of multiple determination, $R^2_{b.ad}$, is 0.2772 which means that 27.72% of total variation in interest rate on deposit has been explained by two independent variables a and d. Similarly the multiple correlation coefficient assuming interest rate on deposit as dependent and inflation and risk-free rate as independent, $R_{b.ef}$, is 0.9466. The coefficient of multiple determination($R^2_{b.ef}$) is 0.8960 which means that 89.60% of total variation in dependent variable (interest rate on deposit) has been explained by other two independent variables (inflation and risk-free rate) and remaining variation has been explained by other variables.

Similarly the multiple correlation coefficient taking interest rate on lending as dependent and amount loaned and interest rate on deposit as independent, $R_{d.bc,}$ is 0.7875. The coefficient of multiple determinations, $R^2_{d.bc}$, is 0.6201 which means that total variation in dependent variables has been explained by two independent variables to the extent of 62.01% and remaining is the effect of other factors. The multiple correlation coefficient assuming interest rate on deposit as dependent and inflation and risk-free rate as independent, $R_{d.ef}$, is 0.0670. The coefficient of multiple determination, $R^2_{d.ef}$, is 0.0045 has meaning that almost total variation in dependent variable (interest rate on lending) is due to the effect of other factors.

4.2.2 NABIL Bank Limited

Table 4.3

NABIL Bank Limited

Fiscal Year	Deposit amount (Rs. in million) 'a'	Interest rate on Deposit'b'	Loan amount (Rs. In million)'c'	Interest rate on Lending'd'	Inflation rate 'e'	Risk-free rate'f'
2005	14586.61	3.17	11078.02	9.35	4.5	2.46
2006	19348.40	3.23	13021.28	9.54	8.0	2.84
2007	23342.28	2.81	15681.76	8.625	6.4	2.42
2008	31915.05	4.65	21514.63	8.71	7.7	4.22
2009	37348.26	5.04	27816.56	10.36	12.9	5.44

Source: - Annual Reports of NABIL and Various Bank and Financial Statistics Published by NRB

Table 4.3 depecits the total amount deposited ; average interest offfered on such deposits; total amount loaned; interest rate charged on such lending of NABIL for seven ficscal years covering from FY 2004/2005 to 2008/2009. Table 4-3 also contains the inflation rate and risk-free rate (91 days treasury bill rate) for the same fiscal years. The correlation coefficient between interest rate and other varibles are presented in table 4-4. Lower part of table 4-4 contains the multiple correlation coefficient and coefficient of multiple determination. The correlation coefficeint between interest rate on deposits and amount deposit (r_{ab}) is 0.8858. This means that these two variables are highly positively correlated. When supply of loan able fund (supply of deposit) increase, the interest rate on such deposit increases. In general concept, interest rate on deposit should be positively correlated meaning that higher rate attracts more deposit. However, we have assumed that interest rate is dependent factor which is determined by supply of loan able fund. The coefficient of determination between these two variables, $r^2_{ab,}$ is 0.7846 which means that 78.46 percent of total variation in interest rate on deposit has been explained by independent variable i.e. amount of deposit collected and remaining is due to the effect of other factors in the economy. t-statistics for the testing the significance of the correlation is 3.31. Since the tabulated t-value at 5 percent level of significance for 4 degree of freedom (2.77) is less than the calculated value, correlation coefficient is significant. This means that the variables mentioned (interest rate on deposit and amount deposited) of

NABIL are significantly correlated and an increase (decrease) in the amount of deposit brings a increment (decrement) in interest rate on deposit.

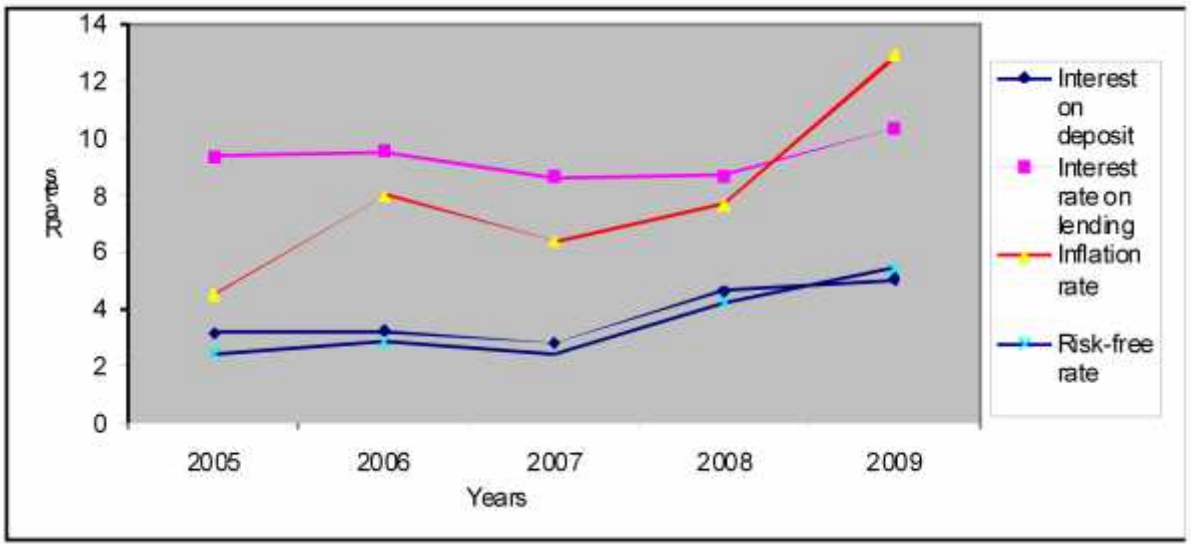
Table 4.4

Correlation Analysis Nabil

Variables	Coefficient of correlation	Coefficient of determination	t-statistics	Table value	Remarks
r_{ab}	0.8858	0.7846	3.31	2.77	Significant
r_{bd}	0.4687	0.2197	0.92	2.77	Insignificant
r_{cd}	0.4347	0.1889	0.84	2.77	Insignificant
r_{be}	0.7739	0.5989	2.12	2.77	Insignificant
r_{bf}	0.9743	0.9492	7.49	2.77	Significant
r_{de}	0.7154	0.5118	1.77	2.77	Insignificant
r_{df}	0.5788	0.3350	1.23	2.77	Insignificant
Multiple Correlation Coefficient		$R_{b.ad} = 0.9080$	**Coefficient of Multiple Determination**		$R^2_{b.ad} = 0.8245$
		$R_{d.bc} = 0.4692$			$R^2_{d.bc} = 0.2201$
		$R_{b.ef} = 0.9959$			$R^2_{b.ef} = 0.9918$
		$R_{d.ef} = 0.7267$			$R^2_{d.ef} = 0.5281$

Figure 4.2

Relationship between Rates of NABIL



The correlation coefficient between interest rate on lending and amount of loan-advanced, r_{cd}, has been found 0.4347 which means the variables are positively correlated but in small proportion. This means when supply of loan amount increases interest on lending also increases in same proportion. The coefficient of determination, $r^2_{cd,}$ of 0.1896 means that 18.96 percent of total variation in amount loaned has been explained by the variation in interest rate on lending and remaining is the effect of other factors. T-value for testing the significance of the correlation coefficient is 0.84 which is less than table value of 2.77. Since, the calculated t-value 0.84 is less than the tabulated value at 5 percent level of significance for 4 degree of freedom, the correlation coefficient is insignificant. Therefore, it can be concluded that the amount loaned and interest on lending of NABIL are not significantly correlated and movement in interest rate on lending of HBL doesn't make any changes in amount loaned.

Similarly, the correlation coefficient between interest rate on lending and interest rate on deposit, $r_{bd,}$ is 0.4687 which means that these two variables are positively correlated but in small proportion. The direction and proportion of movement of both rates is same if interest rate on deposit increases, the interest rate on lending also increases in same but small proportion and vice versa. The coefficient of determination between these variables, $r^2_{bd,}$ is 0.2197 which means that 21.97 percent of total variation in dependent variable (interest rate on lending) has been explained by the variation in independent variable (interest rate on deposit) and remaining variance is the response of the other factors in the economy. Test statistics for testing the significance of the correlation coefficient is 0.92 which is lesser than tabulated value. Since the calculated t-value is less than tabulated value at 5 percent level of significance for 4 degree of freedom (2.77) the correlation coefficient is not significant which means that interest rate on deposit and that on lending of NABIL are not significantly correlated.

Another variable in economy that affects interest rate is the inflation. The correlation coefficient between interest rate on deposit and inflation rate, $r_{be,}$ is 0.77 which means that these two variables are positively correlated. An increment in inflation brings increment in interest rate on deposit and vice versa. In general concept also, there is

positive correlation between these variables. The coefficient of determination, $r^2_{be,}$ of 0.5989 means that, of the total variation in dependent variable (interest rate on deposit); only 59.89% has been explained by the variation in independent variable (inflation rate). t-value for testing the significance of the correlation coefficient is 2.12 which is less than the tabulated t-value for the 5 degree of freedom at 4 percent level of significance, 2.77. Since, the calculated value is less than table value the correlation coefficient is not significant which means that interest rate on deposit of NABIL is not correlated with the inflation rate and movement in inflation rate does not affect the interest rate on deposit significantly.

Another variable in the economy that is considered to be affecting factor of interest rate in financial market is the risk-free rate. The correlation coefficient between interest rate on deposit of NABIL and the risk-free rate (rate on 91 days treasury bill), $r_{bf,}$ is 0.9743 which shows that the variables are highly positively correlated. The change in risk-free leads the change in the interest rate in same direction. The coefficient of determination r^2_{bf} is 0.9493 which means that 94.93 percent of total variation in interest on deposit is due to the effect of the variation in independent variable (risk-free rate) and remaining is the effect of other factors. The t-value for testing the significance of the correlation coefficient is 7.49 which is significantly greater than the table value for 5 degree of freedom at 4 percent level of significance, 2.77. From this it is revealed that interest rate on deposit of NABIL is significantly correlated with the risk-free rate and risk-free rate affect interest rate on deposit of NABIL significantly.

Similarly the relationship of interest rate on lending of NABIL with inflation has also been examined. The coefficient of correlation between inflation and interest rate on lending, $r_{de,}$ is 0.7154 which shows that the variables are positively correlated. Movement in inflation rate leads movements in interest rate on lending in same direction. The coefficient of determination between these variables, $r^2_{de,}$ is 0.5118 which means that 51.18% of total variation in dependent variable (interest rate on lending) has been explained by the variation in independent variable (inflation rate) and remaining is due to the effect of other factors. The t-value for testing the significance of correlation

coefficient is 1.77. Since, the calculated t-value is smaller than the tabulated t-value for 5 degree of freedom at 4 percent level of significance 2.77; the variables are not correlated significantly. This means that the lending rate of NABIL is not significantly correlated with the inflation rate.

The effect of risk-free rate of interest on interest rate on lending of NABIL has also been examined through the analysis of correlation between these variables. The coefficient of correlation between these variables, $r_{df,}$ is 0.5788. This means that there is positive relationship between these variables. Since, interest rate is dependent on risk-free rate; the variation in risk-free rate brings the variation in interest rate on lending in the same direction. The coefficient of determination between variables is 0.3350 which indicates that 33.50% of total variation in interest rate on lending is explained by the variation in risk-free rate and remaining is the effect of other factors. The t-value for testing the significance of the

correlation coefficient is 1.23. Since, the calculated t-value is smaller than table value at 5 percent level of significance for 4 degree of freedom (2.77), the correlation coefficient is not significant. This means that the interest rate on lending of NABIL is not significantly affected by the risk-free rate.

To examine the combined effect of two factors on interest at once, multiple correlation coefficient has also been computed. The multiple correlation coefficient taking interest rate on deposit as dependent and amount deposited and interest rate on lending as independent, $R_{b.ad,}$ is 0.9080. The coefficient of multiple determination, $R^2_{b.ad}$, is 0.8244 which means that 82.44% of total variation in interest rate on deposit has been explained by two independent variables a and d. Similarly the multiple correlation coefficient assuming interest rate on deposit as dependent and inflation and risk-free rate as independent, $R_{b.ef}$, is 0.9959. The coefficient of multiple determination ($R^2_{b.ef}$) is 0.9918 which means that 99.18% of total variation in dependent variable (interest rate on deposit) has been explained by other two independent variables (inflation and risk-free rate) and remaining variation has been explained by other variables.

Similarly the multiple correlation coefficient taking interest rate on lending as dependent and amount loaned and interest rate on deposit as independent, $R_{d.bc,}$ is 0.4692. The coefficient of multiple determinations, $R^2_{d.bc}$, is 0.2201 which means that total variation in dependent variables has been explained by two independent variables to the extent of 22.01% and remaining is the effect of other factors. The multiple correlation coefficient assuming interest rate on deposit as dependent and inflation and risk-free rate as independent, $R_{d.ef}$, is 0.7267. The coefficient of multiple determination, $R^2_{d.ef}$, is 0.5281 has meaning that 52.81% variation in dependent variable (interest rate on lending) is due to the effect of other factors.

4.2.3 Nepal Bangladesh Bank Limited (NBBL)

Table 4.5

Nepal Bangladesh Bank Limited (NBBL)

Fiscal Year	Deposit amount (Rs. in million) 'a'	Interest rate on Deposit'b'	Loan amount (Rs. In million)'c'	Interest rate on Lending'd'	Inflation rate 'e'	Risk-free rate'f'
2005	12125.53	4.6	8739.78	9.08	4.5	2.46
2006	13014.86	4.34	9010.71	9.08	8.0	2.84
2007	9463.96	4.34	8302.74	10	6.4	2.42
2008	10883.65	4.34	8419.97	8.43	7.7	4.22
2009	9995.63	4.34	8507.88	8.16	12.9	5.44

Source: - Annual Reports of NBBL and Various Bank and Financial Statistics Published by NRB

Table 4.5 depecits the total amount deposited ; average interest offfered on such deposits; total amount loaned; interest rate charged on such lending of NBBL for seven ficscal years covering from FY 2004/2005 to 2008/2009. Table 4.5 also contains the inflation rate and risk-free rate (91 days treasury bill rate) for the same fiscal years. The correlation coefficient between interest rate and other varibles are presented in table 4-6. Lower part of table 4.6 contains the multiple correlation coefficient and coefficient of multiple determination. The correlation coefficeint between interest rate on deposits and amount deposit (r_{ab}) is 0.3908 This means that these two variables are positively correlated but in small proportion. When supply of loan able fund (supply of deposit) increase, the interest

rate on such deposit also increase in small proportion. The coefficient of determination between these two variables, $r^2_{ab,}$ is 0.1527 which means that 15.27 percent of total variation in interest rate on deposit has been explained by independent variable i.e. amount of deposit collected and remaining is due to the effect of other factors in the economy. t-statistics for the testing the significance of the correlation is 0.74. Since the tabulated t-value at 5 percent level of significance for 4 degree of freedom (2.77) is greater than the calculated value, correlation coefficient is not significant. This means that the variables mentioned (interest rate on deposit and amount deposited) of NBBL are not significantly correlated.

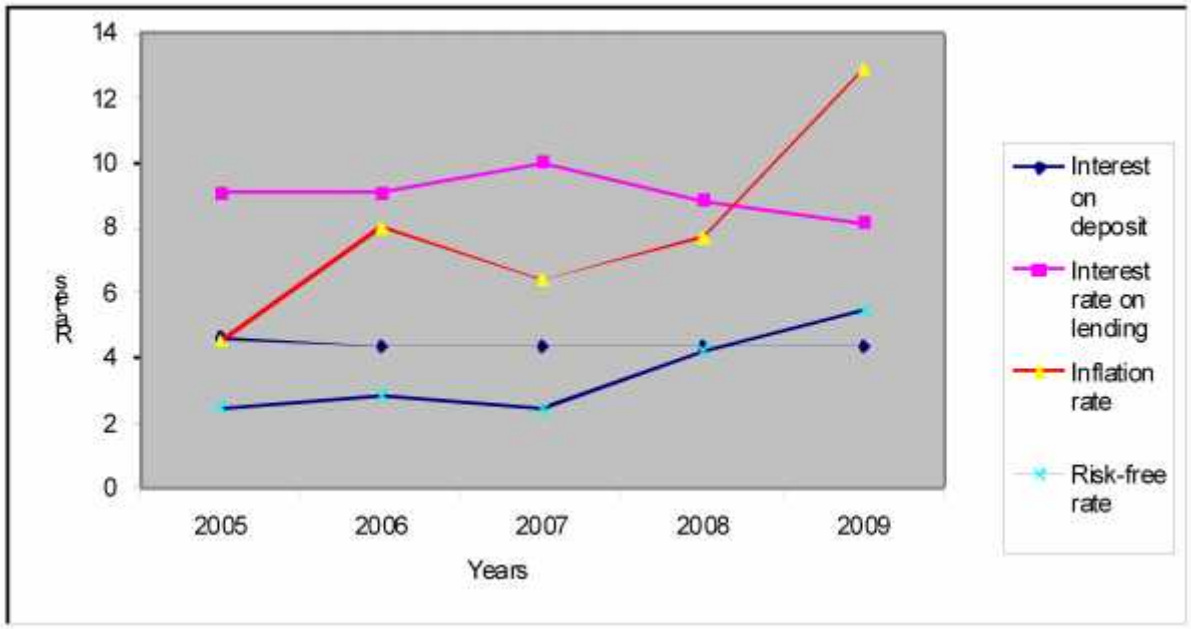
Table 4.6

Correlation analysis of NBBL

Variables	**Coefficient of correlation**	**Coefficient of determination**	**t-statistics**	**Table value**	**Remarks**
r_{ab}	0.3908	0.1527	0.74	2.77	Insignificant
r_{bd}	0.1020	0.0104	0.18	2.77	Insignificant
r_{cd}	-0.0924	0.0085	0.16	2.77	Insignificant
r_{be}	-0.6098	0.3718	1.33	2.77	Insignificant
r_{bf}	-0.4305	0.1853	0.83	2.77	Insignificant
r_{de}	-0.6585	0.4336	1.52	2.77	Insignificant
r_{df}	-0.8675	0.7525	3.02	2.77	Significant
Multiple correlation coefficient		$R_{b.ad} = 0.4135$	**Coefficient of multiple determination**		$R^2_{b.ad} = 0.1709$
		$R_{d.bc} = 0.1626$			$R^2_{d.bc} = 0.0264$
		$R_{b.ef} = 0.6576$			$R^2_{b.ef} = 0.4324$
		$R_{d.ef} = 0.9028$			$R^2_{d.ef} = 0.8150$

Figure 4.3

Relationship between Rates of NBBL



The correlation coefficient between amount of loan-advanced and interest rate on lending, r_{cd}, is -0.0924. This means that the variables are negatively correlated but in small proportion. This negative correlation coefficient reveals that when interest on lending decreases, the amount of loan advanced increases. Here the amount of loan is dependent variable which is affected by interest rate on lending. The coefficient of determination, r^2_{cd}, is 0.0085 which means that almost total percent of variation in dependent variable (amount loaned) has been explained by other variables in the economy rather than interest rate on lending. t-value for testing the significance of the correlation coefficient between variables c and d is 0.16. Since the calculated t-value (0.16) is less than the tabulated t-value at 5 percent level of significance for 4 degree of freedom (2.77), correlation coefficient is not significant which means that the variables (interest rate on lending and amount loaned) are not significantly correlated.

Similarly, the correlation coefficient between interest rate on lending and interest rate on deposit, $r_{bd,}$ is 0.1020. This shows that there is positive correlation between these two

variables but in small proportion. The positive correlation shows that an increment in interest rate on deposit brings increment in interest on lending. The coefficient of determination between these two variables, r^2_{bd}, is 0.0104 that shows that 1.04 percent of total variation in the interest rate on lending has been explained by the variation in interest rate on deposit and remaining is due to the effect of other factors or we can say that almost total variation in the interest rate on lending has been explained by other factors in economy. t-value for testing the significance of the correlation coefficient is 0.18 which is less than the table value at 5 percent level of significance for 4 degree of freedom, 2.77. Since the calculated value is less than the table value, the correlation coefficient is not significant which means that both the interest rates are not correlated.

Inflation is also considered as an affecting factor of interest rate. Hence, the effect of inflation has also been analyzed. The correlation coefficient between interest rate on deposit and inflation rate, $r_{be,}$ is -0.6098 which shows that there is negative correlation between these two variables. When inflation increases, the interest rate on deposit offered by NBBL decreases. The coefficient of determination, $r^2_{be,}$ is 0.3718 means that, of the total variation in dependent variable (interest rate on deposit) is explained by the variation in independent variable (inflation rate) to the extent of 37.18% and other variables are responsible for remaining variation. t-value for testing the significance of the correlation coefficient is 1.33 which is smaller than the table value. Since the calculated value is smaller than the tabulated for 5 degree of freedom at 4 percent level of significance, 2.77, the variables are not significantly correlated. So we can say that change in inflation has not any significant impact on interest rate on deposit of NBB.

Similarly, the impact of risk-free rate on interest on deposit has been examined through the correlation analysis. The correlation coefficient between these variables, r_{bf}, is -0.4305 that shows the negative correlation between variables and tells that increase (decrease) in interest rate offered on deposit is caused by decrease (increase) in risk-free rate. The coefficient of determination of 0.1853 between variables, r^2_{bf}, shows that 18.53% of total variation in interest rate on deposit has been explained by the variation in risk-free rate and remaining is due to the effect of other factors. The t-value for testing the significance of the correlation coefficient is 0.83 which is smaller than the table value

at 5 percent level of significance for 4 degree of freedom, 2.77. Since, the calculated value is smaller than table value, the coefficient of correlation is statistically insignificant. Hence we conclude that the variables, interest rate on deposit and risk free rate of NBB are not correlated even if analysis shows the negative correlation coefficient of -0.4305.

The correlation coefficient of -0.6585 between inflation and interest rate on lending, $r_{de,}$ shows that the variables are negatively correlated. Increase in inflation causes decrease in interest rate on lending. The coefficient of determination between variables, $r^2_{de,}$ is 0.4336 which shows that 43.36% of total variation in interest rate on lending of NBBL has been explained by inflation rate and remaining is due to the effect of other factors. The t-value for testing the significance of correlation coefficient is 1.52 which is smaller than table value at 5 percent level of significance for 4 degree of freedom, 2.77. As the calculated value is smaller than table value, the correlation coefficient is insignificant which means that the variables, interest rate on lending and inflation rate, are not correlated even if the analysis shows a negative coefficient of -0.6585.

Another affecting factor of interest rate is risk-free rate of interest on 91 days treasury bill rate. Whether the impact of risk-free rate on interest on lending is significant or not has been analyzed. The correlation between variables, r_{df}, shows a negative coefficient of -0.8675 which shows that there exists the negative correlation between these variables. The coefficient of determination between these variables is 0.7525 which tells that 75.25% of total variance in interest on lending is the effect of risk-free rate and remaining is the effect of other factors. The test statistics (t-value) for testing the significance of correlation coefficient is 3.02 which is greater than tabulated value at 5 percent level of significance for 4 degree of freedom, 2.77. Since, the calculated value is greater than tabulated value, the correlation coefficient is significant. So we can say that risk-free rate of interest has significant impact on interest rate on lending charged by NBBL because the coefficient of correlation is statistically significant.

To know the effects of two factors at once on interest rate, multiple correlations has been computed and presented at the lower part of table 4-6. The multiple correlation coefficient between interest rate on deposit and amount deposited and interest rate on

lending taking interest rate on deposit as independent and other two as independent, $R_{b.ad,}$ is 0.4135. The coefficient of multiple determination, $R^2_{b.ad}$, is 0.1709 which shows that variation to the extent of 17.09% in dependent variable has been explained by two independent variables and remaining is by other factors. Similarly, the multiple correlation coefficient between interest rate on deposit and inflation rate and risk-free rate of interest taking interest rate on deposit as dependent and other two as independent, $R_{b.ef}$, is 0.6576. The coefficient of multiple determination, $R^2_{b.ef}$, is 0.4324 which shows that 43.24% of total variation in dependent variables is the effect of independent variables and remaining is the effect of other factors.

On the other hand, the multiple correlation coefficient between interest rate on lending and amount loaned and interest rate on deposit assuming interest rate on lending as dependent variable and other two as independent variables, $R_{d.bc,}$ is 0.1626. The coefficient of multiple determination, $R^2_{d.bc}$, is 0.0264 means that almost total variation in interest rate on lending has been explained by other variables in the economy. Similarly, the multiple correlation coefficient between interest rate on lending and inflation rate and risk-free rate; assuming interest rate on lending, $R_{d.ef}$ is 0.9028. The coefficient of multiple determination, $R^2_{d.ef}$, is 0.8150 which means that only 81.50% of total variation in dependent variable is the effect of other two independent variables and remaining is the effect of other factors.

4.2.3 Bank of Kathmandu (BOK)

Table 4.7

Bank of Kathmandu (BOK)

Fiscal Year	Deposit amount (Rs. in million) 'a'	Interest rate on Deposit'b'	Loan amount (Rs. in million)'c'	Interest rate on lending'd'	Inflation rate 'e'	Risk-free rate 'f'
2005	8942.80	3.03	6166.90	9.75	4.5	2.46
2006	10429.30	3.07	7525.20	9.64	8.0	2.84
2007	12358.60	2.64	9691.00	9.7	6.4	2.42
2008	15832.70	3.43	12692.90	9.71	7.7	4.22
2009	18083.90	3.43	14910.60	10.52	12.9	5.44

Source: - Annual Reports of BOK and Various Banking and Financial Statistics Published by NRB

Table 4.7 shows the total amount deposited, interest rate offered on such deposit, amount loaned and interest on such lending of BOK. Table also consists of inflation rate and risk-free rate of interest for five fiscal years covering from 2004/05 to 2008/09. To show the impact of other variables on interest rate, various correlations have been computed and presented in table 4.7. Multiple correlation coefficient between variables assuming interest rate as a dependent variable have also been calculated and presented in table 4-8. The correlation coefficeint between interest rate on deposits and amount deposited $r_{ab\ is\ 0.65,}$ this means these two variables are positively correlated. The coefficient of determination of these two variables r^2_{ab} is 0.4272 which means that 42.72% percent of total variation in interest rate on deposit has been explained by independent variable i.e. amount of deposit collected and remaining is due to the effect of other factors in the economy. t-statistics for testing the significance of the correlation is 1.98. Since the tabulated t-value at 5 percent level of significance for 4 degree of freedom is (2.77) which is greater than the calculated value. Even the variables are positively correlated; statistically they are not significant.

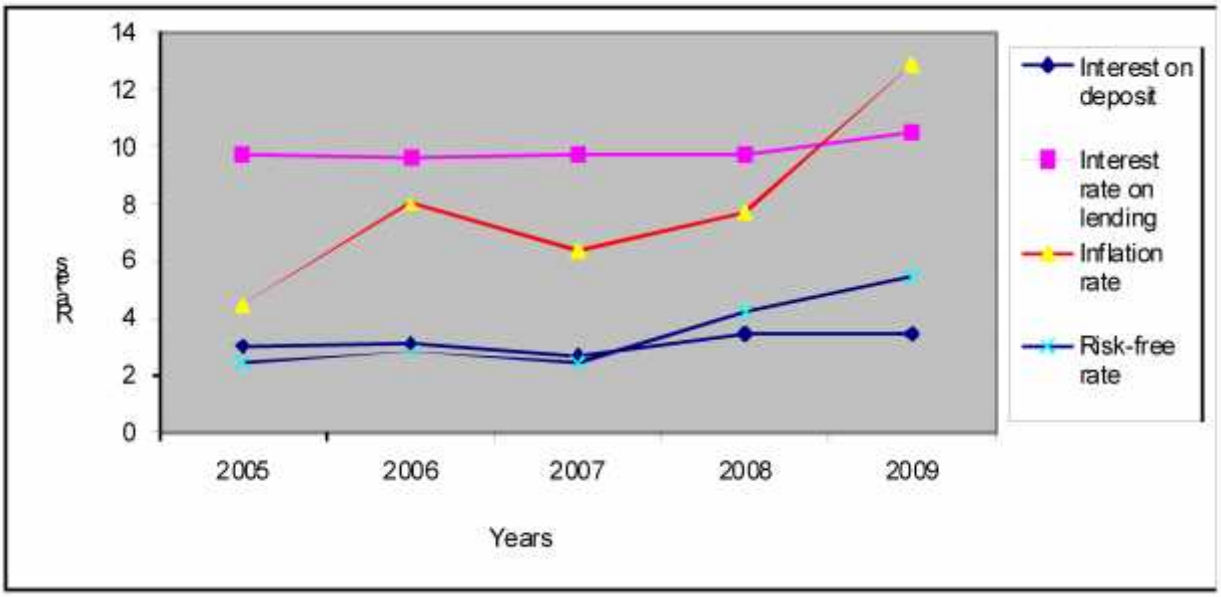
Table 4.8

Correlation Analysis BOK

Variables	**Coefficient of correlation**	**Coefficient of determination**	**t-statistics**	**table value**	**Remarks**
r_{ab}	0.6536	0.4272	1.98	2.77	Significant
r_{bd}	0.5269	0.2776	1.07	2.77	Significant
r_{cd}	0.7229	0.5226	1.81	2.77	Significant
r_{be}	0.6115	0.3739	1.34	2.77	Significant
r_{bf}	0.8462	0.7160	2.75	2.77	Insignificant
r_{de}	0.8529	0.7274	2.83	2.77	Significant
r_{df}	0.8247	0.6801	2.53	2.77	Insignificant
Multiple Correlation Coefficient		$R_{b.ad} = 0.9561$	**Coefficient of Multiple Determination**		$R^2_{b.ad} = 0.9141$
		$R_{d.bc} = 0.7290$			$R^2_{d.bc} = 0.5314$
		$R_{b.ef} = 0.9017$			$R^2_{b.ef} = 0.8131$
		$R_{d.ef} = 0.8646$			$R^2_{d.ef} = 0.7475$

Figure 4.4

Relationship between Rates of BOK



The correlation coefficient between amount of loan-advanced and interest rate on lending, r_{cd}, is 0.7229. This means that the variables are positively correlated. Here the amount of loan is dependent variable which is affected by interest rate on lending or when increment on loan amount increase there will be increment on interest rate on lending. The coefficient of determination, r^2_{cd}, is 0.5226 which means that 52.26% of total variation in dependent variable (amount loaned) has been explained by interest rate on lending and remaining is due to other variables in the economy. t-value for testing the significance of the correlation coefficient between variables c and d is 1.81. Since the calculated t-value (1.81) is less than the tabulated t-value at 5 percent level of significance for 4 degree of freedom (2.77), correlation coefficient is not significant which means that the variables (interest rate on lending and amount loaned) are not significantly correlated. Even there exists positive correlation, but it is statistically not significant. So we can say that change in amount loaned has not any significant impact on interest rate on lending of BOK.

Similarly, the correlation coefficient between interest rate on lending and interest rate on deposit, $r_{bd,}$ is 0.5269. This shows that there is positive correlation between these two

variables. The positive correlation shows that an increment in interest rate on deposit brings increment in interest rate on lending. The coefficient of determination between these two variables, r^2_{bd}, is 0.2776 which has a meaning that 27.76 percent of total variation in the interest rate on lending has been explained by the variation in interest rate on deposit and remaining is due to the effect of other factors. t-value for testing the significance of the correlation coefficient is 1.07 which is less than the table value at 5 percent level of significance for 4 degree of freedom, 2.77. Since the calculated value is less than the table value, the correlation coefficient is not significant which means that both the interest rates are not correlated.

Inflation is also considered as an affecting factor of interest rate. Hence the effect of inflation has also been analyzed. The correlation coefficient between interest rate on deposit and inflation rate, $r_{be,}$ is 0.6115 which shows that there is positive correlation between these two variables. When inflation increases, the interest rate on deposit offered by BOK also increases. The coefficient of determination, $r^2_{be,}$ is 0.3739 means that, of the total variation in dependent variable (interest rate on deposit) is explained by the variation in independent variable (inflation rate) to the extent of 37.39% and other variables are responsible for remaining variation. t-value for testing the significance of the correlation coefficient is 1.34 which is smaller than the table value. Since the calculated value is smaller than the tabulated for 5 degree of freedom at 4 percent level of significance, 2.77, the variables are not significantly correlated. So we can say that change in inflation has not any significant impact on interest rate on deposit of BOK.

Similarly the impact of risk-free rate and interest on deposit has been examined through the correlation analysis. The correlation coefficient between these variables, r_{bf}, is 0.8462 which shows the positive correlation between variables and tells that increase (decrease) in interest rate offered on deposit is caused by increase (decrease) in risk-free rate. The coefficient of determination of 0.7160 between variables, r^2_{bf}, shows that 71.60% of total variation in interest rate on deposit has been explained by the variation in risk-free rate and remaining is due to the effect of other factors. The t-value for testing the significance of the correlation coefficient is 2.75 which is greater than the table value at 5 percent

level of significance for 4 degree of freedom, 2.77. Since, the calculated value is greater than table value, the coefficient of correlation is significant. Hence we conclude that the variables, interest rate on deposit and risk free rate of BOk are significantly correlated.

The correlation coefficient of 0.8529 between inflation and interest rate on lending, $r_{de,}$ shows that the variables are positively correlated. Increase in inflation causes increase in interest rate on lending. The coefficient of determination between variables, $r^2_{de,}$ is 0.7274 which shows that 72.74% of total variation in interest rate on lending of BOK has been explained by inflation rate and remaining is due to the effect of other factors. The t-value for testing the significance of correlation coefficient is 2.83 which is greater than table value at 5 percent level of significance for 4 degree of freedom, 2.77. As the calculated value is greater than table value, the correlation coefficient is significant which means that the variables, interest rate on lending and inflation rate, are significantly correlated.

Another affecting factor, interest rate on lending and risk-free rate of interest on 91 days treasury bill rate. Whether the impact of risk-free rate on interest on lending is significant or not has been analyzed. The correlation between variables, r_{df}, shows a positive coefficient of 0.8247 which shows that there exists the positive correlation between these variables. The coefficient of determination between these variables is 0.6801 which tells that 68.01% of total variance in interest on lending is the effect of risk-free rate and remaining is the effect of other factors. The test statistics (t-value) for testing the significance of correlation coefficient is 2.53 which is less than tabulated value at 5 percent level of significance for 4 degree of freedom, 2.77. Since, the calculated value is smaller than tabulated value; the correlation coefficient is not significant. Even if analysis shows a positive correlation, statically variables are not significantly correlated and risk-free rate of interest has not any significant impact on interest rate on lending of BOK

To know the effects of two factors at once on interest rate, multiple correlations has been computed and presented at the lower part of table 4.8. The multiple correlation coefficient between interest rate on deposit and amount deposited and interest rate on lending taking interest rate on deposit as independent and other two as independent, $R_{b.ad,}$ is 0.9561. The coefficient of multiple determination, $R^2_{b.ad}$, is 0.9141 which shows that

variation to the extent of 91.41% in dependent variable has been explained by two independent variables and remaining is by other factors. Similarly, the multiple correlation coefficient between interest rate on deposit and inflation rate and risk-free rate of interest taking interest rate on deposit as dependent and other two as independent, $R_{b.ef}$, is 0.9017. The coefficient of multiple determination, $R^2_{b.ef}$, is 0.8130 which shows that 81.30% of total variation in dependent variables is the effect of independent variables and remaining is the effect of other factors.

On the other hand, the multiple correlation coefficient between interest rate on lending and amount loaned and interest rate on deposit assuming interest rate on lending as dependent variable and other two as independent variables, $R_{d.bc,}$ is 0.7290. The coefficient of multiple determination, $R^2_{d.bc}$, is 0.5314 means that 53.14% of total variation in interest rate on lending has been explained by interest rate on deposit and amount loaned and remaining is due to other factors in the economy. Similarly, the multiple correlation coefficient between interest rate on lending and inflation rate and risk-free rate; assuming interest rate on lending, $R_{d.ef}$ is 0.8646. The coefficient of multiple determination, $R^2_{d.ef}$, is 0.7475 which means that only 74.75% of total variation in dependent variable is the effect of other two independent variables and remaining is the effect of other factors.

4.3 Qualitative Analysis

Interest rate in Nepalese financial market is also affected to large extent by various qualitative factors rather than responding demand, supply, inflation and risk-free rate. There are various factors affecting interest rates like, open border with India, political instability and voilance, competition between financial institutions, NRB rules and regulations, seasonal impact, maturity period of deposit and lending etc.

4.3.1 Maturity Period and Interest Rate

Table 4.9

Maturity Period and Interest Rate

Maturity Period	Latest Interest rate on Fixed Deposit			
	HBL	NABIL	NBBL	BOK
7 days	3.0	-	-	3.0
14 days	3.12	-	-	3.0
1 months		5.5	4.0	4.0
2 months	4.5	-	-	-
3 months	5.0	6.5	4.5	4.5
6 months	6.0	7.5	6.5	6.0
1 Year	8.0	8.5	7.5	8.5
2 Years	8.5	8.75	8.5	8.75
3 Years	9.0	9.0	9.5	9.0
Above 3 Years	11.0	9.5	10.0	11.75

Table 4.9 depecits the latest interest rates on fixed deposit for diffirent period of time of sample organizations.Theoretically, interest rate is affected by the maturity period of deposit. The longer the maturity period, higher will be the interest rate on such deposit. This principle is significant in Nepalese context for almost all financial institutions. We have collected latest interest rates on fixed deposit for different maturity periods and these all are different according to maturity period. Above table no 4.9 shows that interest rate on fixed deposit of all sample banks are increasing according to maturity period, which matches to the theory.

Theoretically, interest rate on lending also affected by the maturity period of the loan for some extent, longer the maturity period, higher the default risk (i.e. failure to repay to loan) and hence higher will be the risk-premium added to prime interest rate. This principle is not significant in Nepalese context. Not almost all of the organizations do not consider maturity period of loan but few institutions are aware of maturity. Generally, institutions do not provide long-term loan rather they renew frequently according to the borrowers' credit worthiness. However, institutions evaluate the borrowers' creditworthiness in terms of size of their business or project, cash flow capacity and pattern, nature of loan, goodwill and trustworthiness of borrower etc. Therefore, rate for

other category is higher than prime. Institutions do not quote their interest rate on lending according to maturity period rather they cote separate rate for different sectors. But few organizations cote their rate according to maturity. They charge higher interest for longer-maturity-loan.

From the analysis, we can say that interest rate on lending in Nepalese financial market does not differ significantly according to maturity period. Some interest rate may be applied for one year and two years. But interest rate may differ borrower to borrower even if they are from same sector and borrowing for same purpose.

4.3.2 Competition

Competition is the most important factor among the various factors affecting interest rate. Competition occupies a major place for the development of financial institutions within the financial system of Nepal. Interest rates charged and offered by Nepalese financial institutions compete within their group. Commercial banks compete with commercial banks; development banks compete with other development banks, finance company with other finance companies and so on. Development banks also seem less competition-sensitive than commercial banks because their target groups are different and their purposes are also differ. Thus, their interest rate also differs according to customer-status. Thus, even there exists competition between development banks to some extent, but they are not much competitive forgetting their target customers. But the interest rates of commercial banks and finance companies are highly competitive. We can see the recent condition of interest rate increased by commercial banks as well as other financial institutions. Almost two to five percent changes have been made by commercial banks in deposit as well as in lending.

Table 4.10
Comparison of Interest Rates

Fiscal year	Deposit rates				Lending rates			
	HBL	NABIL	NBBL	BOK	HBL	NABIL	NBBL	BOK
2005	2.87	3.17	4.60	3.03	9.12	9.35	9.08	9.75
2006	2.69	3.23	4.34	3.07	8.95	9.54	9.08	9.64
2007	2.69	2.81	4.34	2.64	7.3	8.63	10.00	9.70
2008	3.22	4.65	4.34	3.43	7.99	8.71	8.43	9.71
2009	4.31	5.04	4.34	3.43	8.41	10.36	8.16	10.52

Source: Annual Reports of Concerned Institutions and NRB's Publications. Interest Rates Taken as Average

Figure 4.5

Deposit Rate of Sample Banks

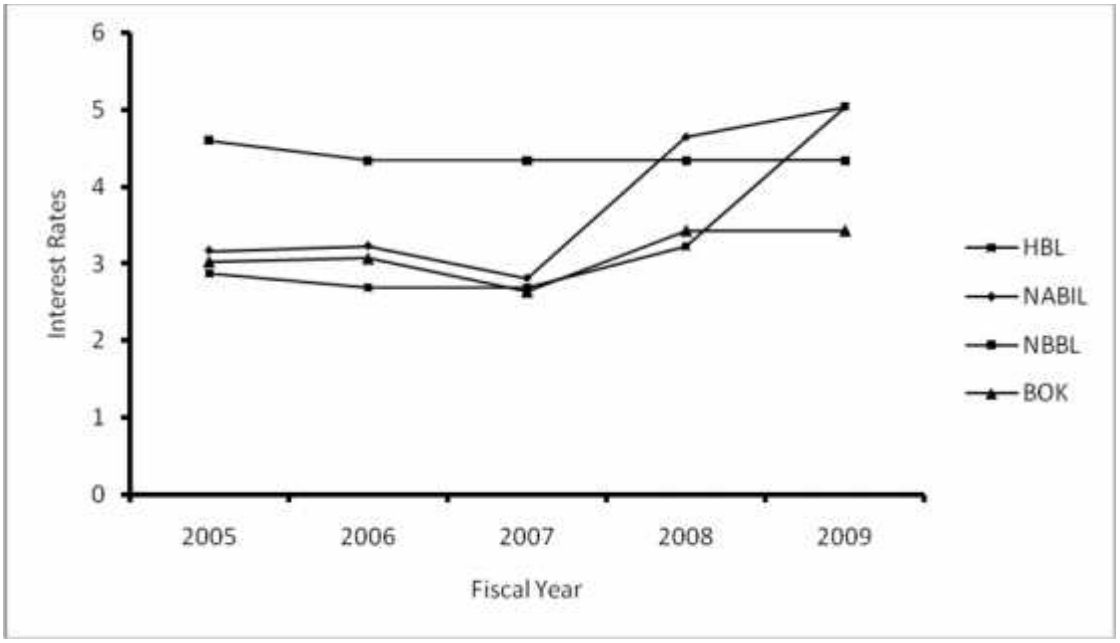
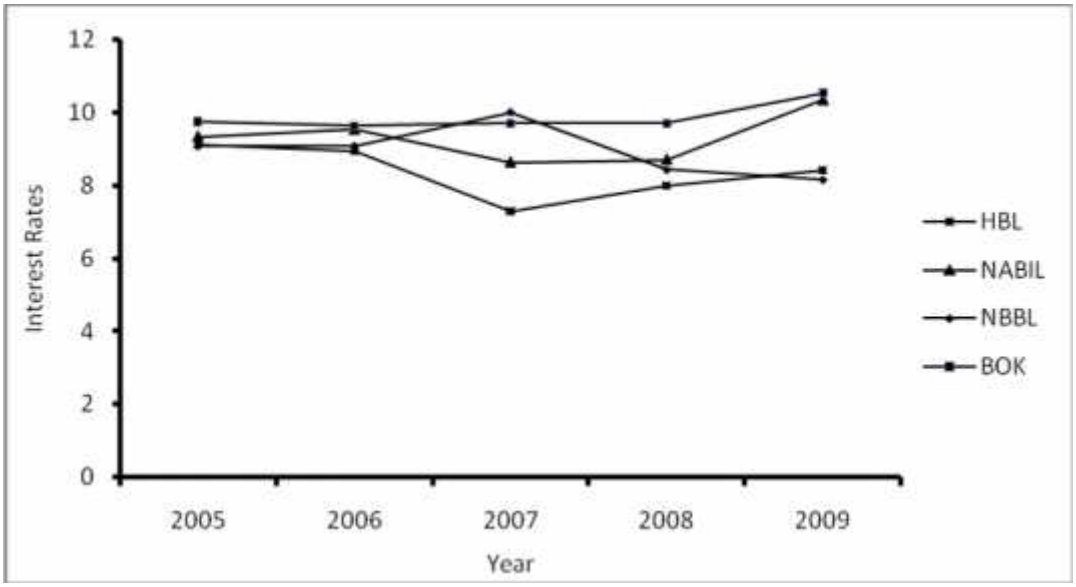


Figure 4.6

Lending Rate of Sample Banks



Above table shows interest rate on deposit and lending of sample organizations. Rates of sample banks have compared with each other and we found that three is high competition between interest rate of sample commercial banks. Interest charged and offered by institution within their group are not much different (i.e. almost same) which shows that interest rate is competitive. Hence, we can conclude that competition affects the interest rate, to large extent, in Nepalese financial market.

4.3.3 Political Instability and Violence

Since Nepal was facing the problem of political instability and violence for few years, our concern is whether the violence and instability directly affects interest rate in financial market or not. We found that the instability and violence is not directly affecting the interest rate charged and offered by the institutions. Instability and violence is affecting the operations of financial institutions. Frequently organized strikes, bands reduce the working hours of the institutions and add the operating cost burden (especially for fixed cost). In long run, interest rate of institution, according to respondent, has affected by the activities of political parties and violence. Such activities dampen the overall economy that is why business growth rate decreases and lending opportunities are

curtailed. This results in decreased demand of loanable fund and interest rate falls. We can see that interest rates in Nepalese financial markets are in decreasing trend. This may be because of slackness in economic growth. Similarly, frequently changing governments are also affecting overall operation of financial institutions including interest rate, through the decision of different government and governor of NRB regarding financial system of the country.

Violence also is reducing the investment opportunities of individuals. People are afraid to invest due to the lack of safety and security. With a fear that their return from investment may be uncertain, people deposit money at bank. Analysis of deposit trend in recent years in Nepalese financial market shows so. Hence, supply of loanable fund in financial institutions is increasing and return on such fund to depositors (interest rate on deposit) is decreasing. Therefore, political instability and violence, in the experience of bankers, have been influencing interest rate indirectly in the financial market of Nepal.

4.3.4 Seasonal Impact

Most often Nepal suffers from natural disaster like landslides and roads are blocked even for a week or month in rainy season. Trading and manufacturing business needs to keep more inventories for their regular operation in the situation of roadblock. Our intuition was that businesses borrow more in the beginning of the rainy season to keep more inventories, which increases the demand of loan and interest rate on lending increases. Therefore, we can conclude that there is y seasonal impact on interest rate in Nepalese Financial Market.

4.3.5NRB and Interest Rate

Central bank has a considerable authority in affecting the level of interest rates by controlling the money supply and credit creation of banks and financial institutions through monetary and fiscal policy. Central bank of Nepal, Nepal Rastra Bank (NRB) has the authority to fix the interest rate of banks and other financial institutions. Now even banks and other financial institutions are partially free to fix their interest rate charged and offered. However, various other activities, policy measures and directives issued by

NRB influence the interest rate directly or indirectly in Nepalese Financial Market. Among these various measures, some are as follows:

4.3.6 NRB's Directives and Interest Rate

Besides taking various monetary measures, NRB also issues directives to commercial banks regarding their activities and policies. Among the various directives issued some of them which affect interest rate charged and offered by Nepalese financial institutions are mentioned here.

Now even banks and other financial institutions are free to fix their interest rate charged and offered, there some directives, which affect indirectly to the interest rate on lending and deposit. Limit for lending to real estate and housing is one of the directives issued by NRB that affects interest rate indirectly.

Single borrower limit is one of the directives issued by NRB that affects interest rate indirectly. As per the directives, commercial banks can provide loan to single borrower (i.e. an individual or an organization or a firm or a company or members of single family) upto 25 percent of their core capital for fund-based loan. But this limit for non-fund based loan is 50% of core capital. However, loan on security of government bond / NRB bond / fixed deposit receipt is not restricted by this provision. Similar restrictions to provide loan for single sector has also been issued by NRB. Such types of restrictions reduce the amount loaned (demand of loan) which may influence the interest rate on lending. Similarly reduced loan-advanced also reduces the deposit requirement and reduction in interest on deposit also occurs.

Limitation regarding fund collection i.e. deposit collection has also been made in directives issued. According to the directive, commercial banks and development banks can collect deposits from public not more than 15 times of their core capital. Such type of limitations reduce the source of fund (fund collection) for the institutions which reduces the liquidity in institutions and impact may be the higher interest rate on lending because of low supply of loanable fund.

NRB also issues directives directly to influence interest rates in financial market. A directive issued in 2007had specified that the commercial banks could offer interest rate more than published rate by 50 basis points on the basis of negotiation with customer for the deposit upto Rs. 200 million and 100 basis points for the deposits of more than Rs. 200 million. Over the published lending rates for all types of loan, the banks could make adjustment upto 50 basis points on the basis of negotiation with the customers. Weighted average interest rate spread must not exceed was 5%. But this restriction is already removed. Now banks and other financial institutions are free to fix their interest rate. They are not allowed to charge interest on flat basis. Hence, instructions and directives issued by NRB in different time period affect the interest rate level in Nepalese Financial Markets.

4.4 Major Findings

The main aim of the study is to show the behavioral change in interest rate by change on its determining or affecting factors. From the study of sample organizations following major findings have been drawn.

HBL

Amount deposit and interest on deposit is positively correlated and interest rate on deposit and lending are positively correlated but in small proportion and both the coefficient are statistically insignificant. Interest rate on lending with inflation and risk free rate are negatively correlated but in small proportion. Similarly, interest rate on deposit with inflation and risk free rate are highly positively correlated and coefficient are also statistically significant.

NABIL

We have found that interest rate on deposit and deposit amount is highly positively correlated and statistically significant. Amount of lending and interest rate on lending is also positively correlated but coefficients are statistically insignificant. Interest rate on lending and deposit as well as interest rate on deposit and inflation rate are positively correlated but coefficients are insignificant. Similarly, interest rate on deposit and risk

free rate is highly positively correlated and coefficients are significant and interest rate on lending with inflation and risk free rate are positively correlated but statistically coefficients are insignificant.

NBBL

Interest rate on deposit and deposit amount, interest rate on deposit and interest rate on lending are positively correlated but coefficients are statistically insignificant. Similarly, lending amount and rate on lending, inflation rate and risk free rate with interest rate on deposit, inflation and risk free rate with interest rate on lending all are negatively correlated and except lending rate and risk free rate all are insignificant.

BOK

Interest rate on deposit and deposit amount, rate on lending and lending amount, interest rate on deposit and lending, inflation rate and risk free rate with interest rate on deposit, inflation and risk free rate with interest rate on lending all are positively correlated and except interest rate on lending and inflation all coefficients are statistically insignificant.

Banks	r_{ab}	r_{cd}	r_{bd}	r_{be}	r_{bf}	r_{de}	r_{df}
HBL	0.4271 insig.	-0.3724 insig.	0.0177 insig.	0.8702 Sig.	0.9449 Sig.	-0.0662 Insig.	-0.0525 Insig.
NABIL	0.8858 Sig.	0.4347 Insig.	0.4687 Insig.	0.7739 Insig.	0.9743 Sig.	0.7154 Insig.	0.5788 Insig.
NBBL	0.3908 Insig.	-0.0924 Insig.	0.1020 Insig.	-0.6098 insig.	-0.4305 Insig.	-0.6585 Insig.	-0.8675 Sig.
BOK	0.6536 Insig.	0.7229 Insig.	0.5269 Insig.	0.6115 Insig.	0.8462 Insig.	0.8529 Sig.	0.8247 Insig.

a= Amount of Deposit

b= Interest Rate on Deposit

c= Amount of Loan- Advanced

d= Interest rate on lending

e= Inflation Rate

f= Risk free rate

CHAPTER - V

SUMMARY, CONCLUSION AND RECOMMENADATIONS

This chapter includes summary, a brief account of the whole study findings and conclusion drawn from the analysis of determining factors of interest rate in Nepalese Financial Market and suggestion or recommendation to the authorities to solve the problems on the basis of the findings.

5.1 Summary

Natural resources are being remained unused due to lack of financial and technical know-how. Circulation of money from savers to users is must for the economic development. Financial system, as an intermediary, facilitates the circulation of fund by collecting scattered fund from savers {viz: household (individuals and family), business and government sector of the economy} and provides the collected fund to users. Financial system as an organized sector in Nepal, to develop the economy and to help to rise the living standard of people through mobilizing capital, was started after the advent of Nepal Bank Limited in 1994 B.S as a joint venture between government and private sector. Currently there are 26 commercial banks, 58 development banks, 152 finance companies, 46 saving and credit co-0peratives and 68 financial NGOs within the financial system of Nepal.

Financial institutions/organizations survive by making profit which is interest spread i.e. difference between interest received and interest charged. Interest is the payment made for the use of money and interest rate is the amount of interest paid per unit of time expressed as a percentage of the amount borrowed. What are the responsible factors for determining the interest rate in Nepalese Financial System/Market was the main purpose of this study. Nepal Rastra Bank, as central bank is the authority to fix the interest rate on deposits and loans of commercial banks and other financial institutions in Nepal since its establishment in 2013. After the restoration of democracy and liberal policy adopted by the government, many financial institutions have been established. NRB also gave freedom to fix the interest rate that they charge and offer. But NRB use to issue directives

regarding overall performance of the financial institutions. Here an attempt is made to analyze the factors affecting the rate of interest. Brief introduction of sample organizations, statement of problem, significance of the study, research hypothesis, limitations of the study, chapter plan are also the components of first chapter.

In second chapter, theoretical review has been made. Different views about interest, function of interest and theories determining interest rates have been reviewed in this chapter which offer insights into the functioning of the financial system. The classical theory of interest emphasizes saving and investment demand as interest rate determining forces, while the liquidity preference theory points to the demand and supply of cash balances. Liquidity preference theory points to the demand and supply of cash balances. Loanable fund theory views interest rate as determined by the total demand for and supply of credit, while the rational expectations theory emphasizes the roles played by public expectations regarding interest rate, economy and the impact of new information on the movement of interest rates to a new equilibrium. Collectively the different theories of interest rates determination examined in this chapter. In this chapter, we consider various factors that cause the interest rate on one security or loan to be different from the rate on another security or loan. The factor includes expectation of inflation, the maturity or length of a security or a loan, the risk of borrower default, taxes etc. If lenders expect a higher rate of inflation during the life of a credit contract, they will adjust upward the nominal interest rate on a loan to achieve their desired real rate of return. According to fisher effect, if expected inflation rate rises, the nominal interest rate on a financial asset must also rise by exactly the same amount, point for point. The yield curve or term structure of interest rate expresses the relationship between the annual rate of return (interest rate) on a financial instrument and its term to maturity when all other factors are held constant. One theory traced in this chapter – the unbiased expectation hypothesis argues that yield curves reflect the interest rate expectations of the market place and hint at the direction, if not the magnitude, of future rate movements. Contending theories such as the liquidity premium view, the preferred habitat theories, and the segmented markets argument, contend that other factors in addition to expectations influence the yield curves or term structure of interest rate. Regardless of which theory is valid, yield curve can play

a key role in management of financial institutions, which borrow a substantial portion of their funds at the short end of the maturity spectrum and lend heavily at longer maturities.

The price of security and its yield (interest/ rate of return) are inversely related. A rise in yield implies a decline in price and vice-versa. The intelligent investor must learn to distinguish one method from another because effective interest rate differs according to method applied for calculating interest. We have examined four different methods in chapter two. Interest rate also affected by economic growth, budget deficit, money supply etc. Specific risk and cost factors affecting interest rate on debt security are marketability, liquidity, default risk, prepayment risk, reinvestment risk, taxability, servicing cost, exchange rate risk etc. Even the study on this topic is not available, some theses and independent studies relating to some aspect of this study have been reviewed in this chapter.

Research design used is analytical and descriptive. Out of the financial system, four commercial banks have been taken as sample. Primary data are collected using questionnaire, interview and secondary data are collected form various publications. Collected data are presented in tabular and graphic form and analyzed using various statistical tolls like, mean, correlation coefficient, t-statistics and coefficient of determination in chapter four. Mainly the relationship between factors assumed to be influencing the interest rate on deposit and lending has been analyzed using correlation. All secondary data are analyzed in descriptive form and conclusion has been drawn which are presented in following section.

5.2 Conclusion

From the analysis of data following conclusions has been drawn.

1. The correlation coefficient between interest rate on deposit and amount of deposit collected of all sample organizations is positive. It ranges from 0.3908 to 0.8858 among the sample organizations. All the correlation coefficients are statistically insignificant except of NABIL. Here, we could see that NABIL have proved the theoretical concept that there must be positive correlation meaning that higher

interest rate on deposit attracts more deposit. The correlation between these two variables of sample organizations except NABIL is statistically insignificant means that this positive correlation is due to other factors in the economy.

2. One variable assumed to be affecting interest rate on lending is amount loaned i.e. demand of fund. The correlation coefficient between amount loaned and interest rate on lending (r_{cd}) of NABIL and BOK is positive whereas of HBL and NBBL is negative. r_{cd} ranges from -0.3724 to 0.7229 among sample organizations. Among four samples NABIL and Bok are positively correlated and NBBL and HBL are negatively correlated. (r_{cd}) of NABIL and BOK are positive means that less amount is demanded at lower rate and NBBL and HBL are negative means that when lending amount increases interest rate on lending decreases. But statistically the correlation of all sample organizations is insignificant. Thus, we can say that this positive and negative correlation is due to other factors.

3. The relationship between interest rate on deposit and inflation rate (r_{bd}) of all sample organization is positive. It ranges from 0.0177 to 0.5269, among the sample organizations but correlation coefficient between these two variables of all sample organizations is statistically insignificant. This positive correlation is due to other factors in the economy. According to the theory and in general concept these two variables should be highly positively correlated and the correlation coefficient of sample organization is positive but in small proportion.

4.The relationship between interest rate on deposit and inflation rate (r_{be}) of all sample organization is positive except NBBL. It ranges from -0.6098 to 0.8702, among the sample organizations but correlation coefficient between these two variables of three sample organizations is statistically insignificant except HBL. This positive and negative correlation is due to other factors in the economy. Theoretically, there should be positive correlation between these two variables, according to Fisher effect. The correlation coefficient of Himalayan bank is positive and statically it is significant, so HBL proves the theory.

5.The correlation between interest rate on lending and risk free rate (r_{df}) of HBL and NBBL is negative whereas of NABIL and BOK is positive. The coefficient of correlation among sample organization lies between -0.8675 to 0.8247. r_{de} for HBL, NABIL and BOK are insignificant means that this negative and positive correlation is due do other factors. Even though, theoretically there should be a positive and perfect relationship, interest rate on lending in Nepalese Financial Market is affected by inflation only to some extent and the correlation between interest rate on lending of NBBL and risk free rate is statically significant means that changes in interest rate on lending is due to changes in risk free rate.

6. Correlation coefficient between interest rate on deposit and risk-free rate r_{bf} is positive except NBBL. The correlation between these two variables of HBL and NABIL is highly positive and statically significant. This means the positive correlation between interest rate on deposit of HBL and NABIL is almost totally affected by risk free rate. The negative correlation of NBBL and positive correlation of BOK are statically insignificant means that correlation is due to other factors in the economy. Theoretically, there should be positive correlation between these two variables and the HBL and NABIL proves the theory.

7. The correlation coefficient between interest rate on lending and inflation rate r_{de} of NABIL and BOK is positive whereas of HBL and NBBL is negative. The coefficient of correlation ranges from -0.6585 and 0.8529 among the sample organizations. But except BOK all the coefficients are statistically insignificant. Thus, the correlation of NABIL, HBL and NBBL is due to other factors in the economy or effect on interest rate on lending doesn't explain by inflation but correlation of BOK is highly affected by inflation.

8.Maturity period of loan is not a significant factor to affect the interest rate on lending in Nepalese Financial Market but it seems little bit significant for interest rate on deposit.

9. Nepalese banking sector is also affected by long-term economic factors like: economic and business growth rate, reduction in lending opportunity due to terrorism, conflict, insecurity and unstable political situation etc. Because of unavailability of investment opportunities, Nepalese Banking sectors are suffering over liquidity during violence of Maoist as shown by increasing trend of deposit and decrease rate on such deposits. But from last two years banks are lending funds on real estate and housing and due to this reason interest rate on lending and deposit has increased.

10. Political instability and violence is not responsible in affecting interest rate, supply of loan amount and deposit amount in Nepalese Financial Market directly but it has great and significant indirect impact on interest charged on lending, interest on deposit, loan amount and deposit amount offered by Nepalese Financial Institutions. During violence of Maoist many industries were closed and there was not any chance to open new industries due to security situation.

5.3 Recommendations

As in other developing countries, the financial market in Nepal also growing in nascent stage. Its existing operational problems, fragile legal framework and unnecessary control are the factors for the underdevelopment of Nepalese financial market. Nepal has committed itself to economic liberalization after correctly recognizing that financial sector reform is an integral part of this process. The role of Banking sector should be effective towards the mobilizing the funds from savers to users. Therefore, based on the study findings and forgoing conclusions, certain recommendations emerged.

In view of above facts and figures, the financial performance of 4 commercial Banks can be listed as follows:

a. As the NRB has authority to control and stimulate the financial system, especially money market, it is also the information source for public and other concerned parties. So, NRB should publish information in time and increase its information

dissemination activities to provide knowledge to the depositors, lenders and other concerned parties so that they can make their decisions correctly.

b. Banks are currently increasing interest rate on deposit and loan as they require more funds. As regulator, NRB should monitor and control the interest rates on both deposit and loan; and spread between lending and deposit rates to confirm that the rates are determined by fair market. But currently there is no liquidity problem due to interest rate increment in deposit as well lending. The financial market, like other aspect of the economy, is tied to the need of stable policies, sustainable peace in the country. Therefore, the government should try to maintain the political stability in sustainable peace for the development of the Banking sector.

c. Government and NRB should promulgate suitable policies to foster the development of money market and to motivate financial intermediaries.
d. Although, there is almost positive correlation between interest rate on deposit and lending (decrement in one rate is almost proportionate with decrement in another rate), the spread (the difference between interest rate on lending and deposit) seems to be higher. Hence, institutions are suggested to maintain reasonable spread between interest rates so that more lending and deposits can be stimulated.

e. Since, Nepal is considered as rich in water resources, the sampled companies would get benefit to explore their lending in hydro sectors also. Further researchers are advised to search for other aspects of interest.

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APPENDICES

Appendix 1

Calculation of Average Interest on Deposit of HBL

Rate in percentage

Years	Savings	Average	Fixed						
			14 days	1 month	2 months	3 months	6 months	1 year	2 years
2005	3.37	7.83	1.75	2.0	-	2.5	3.0	3.75	3.75
2006	2.37	2.69	1.75	2.00	-	2.50	3.0	3.75	3.75
2007	2.75	6.07	1.75	2.0	-	2.5	3.0	3.75	3.75
2008	2.68	3.22	2.0	2.25	-	2.5	3.25	5.0	5.37
2009	2.25	4.31	2.5	3.25	-	3.75	4.5	6.5	10.87

Average (2003) = (3.75+1.75+2.0+2.5+3.0+3.75+3.75)/7 = 2.87 and so on

Credit of HBL

Sectors	2005	2006	2007	2008	2009
Overdraft	9-12	9-12	8-10	8-10	8.75-10.75
Export credit	8.25-8.75	8.25-8.75	6-8.75	7.25-9.75	8.5-10.75
Import L/C	7.4-11.75	7.4-11.75	6-9.5	7-9.5	8.5-10.25
Against FDR	(+) 2	(+)2-(+)2.5	(+)2.25	(+)2-(+)2.5	(+)1.5
Against HMG bond	5-6	5-6	6.5	7	8
Against BG/CG	8.25-9.25	8.25-9.25	6.5-8	7-8	8-10
Against other guarantee	—	—	-	-	-
Industrial loan	8.25-12.75	8.25-12.75	-	-	-
Commercial loan	8.25-12.5	8.25-12.5	-	-	-
Priority sector	11-12.25	11-12.25	10	-	10
Poorer sector	4.5-8.25	4.5-8.25	4.5-8.25	5-8.75	6-8.75
Tern loan	9.5-11.75	9.5-11.75	8-10.5	8.5-10.5	9.5-12.5
Working capital	-	-	-	-	-
Hire purchase	9-11.5	9-11.5	8-9	7.5-9.5	9.5-12
Others	6-13.5	6-13.5	6-12	5-10.5	8.5-11.25
Average*	9.87	8.95	7.30	7.99	8.41

Average = (9+12)/2+ (8.25+8.75)/2+ (7.4+11.75)/2+5.75+(5+6)/2+(8.25+9.25)/2 +(8.25+12.75)/2 +(8.25+12.5)/2+(11+12.25)/2+ (4.5+8.25)/2+ (9.5+11.75)/2 + (9+11.5)/2+(6+13.5)/2 ÷13 = 9.12

Calculation of correlation coefficient between Deposit Amount and Average Interest Rate on Deposit of HBL

Year	Deposit Amount (a)	Int. Rate on Deposit (b)	ab	a^2	b^2
2005	24831.15	2.87	71265.40	616586010.3	8.2369
2006	26456.31	2.69	71167.47	699936338.8	7.2361
2007	29905.94	2.69	80446.97	894365247.3	7.2361
2008	31805.31	3.22	102413.09	1011577744	10.3684
2009	34680.71	4.31	149474.93	1202768987	18.5761
Total	∑a=1253316.36	∑b=15.78	∑ab=474767.88	$\sum a^2$=4425234327	$\sum b^2$=51.6536

Correlation-coefficient between Deposit amount (a) and Interest rate on Deposit (b)

$$(r_{ab}) \text{ X} \frac{n \quad ab \text{ Z} \quad a \quad b}{\sqrt{n \quad a^2 \text{ Z} f \quad a Å^2} \sqrt{n \quad b^2 \text{ Z} f \quad b Å^2}}$$

Where,

N=fiscal year = 5

a^2 X *Sumofsquaresof* var*iable*"*a*"

f $bÅ^2$ X *wholesquareofsummation*"*b*" var*iable*

b X *Sumof* var*iable*"*b*"

ab X *Summationof* var*iables*"*a*" *multiply*"*b*"

f $aÅ^2$ X *wholesquareofsummation*"*a*" var*iable*

a X *Sumof* var*iable*"*a*"

$$fr_{ab} AX \frac{5 \mid 474767.88 Z1253316.36 \mid 15.78}{\sqrt{5 \mid 4425234327 Z(1253316.36)}\sqrt{5 \mid 51.65 Z249.008}}$$

$$X \frac{3375820 Z3770470.613}{\sqrt{1450097325}\sqrt{114.0166}}$$

$$X \frac{394650.613}{406614.2726}$$

= -0.4271 $(r_{ab})^2 = (0.4271)^2 = 0.1824$

Test of significance of correlation coefficient between Deposit Amount and Deposit Rate

t- statistics under null hypothesis;

$$t X \frac{r_{ab}}{\sqrt{1 Z r^2_{ab}}} \mid \sqrt{n Z 2}$$

$\square$ t_{n-2}

$$X \frac{0.4271}{\sqrt{0.5729}} \mid \sqrt{3}$$

$$X \frac{0.4271}{\sqrt{1 Z 0.4271}} \mid \sqrt{5 Z 2}$$

$$X \frac{0.73976}{0.7569} X 0.82$$

/t/= 0.82

Calculation of Correlation Coefficient between Deposit Rate and Lending Rate of HBL

Year	Deposit Rate (b)	Lending Rate (d)	bd	b^2	d^2
2005	2.87	9.12	26.1744	8.2369	83.1744
2006	2.69	8.95	24.0755	7.2361	80.1025
2007	2.69	7.3	19.637	7.2361	53.29
2008	3.22	7.99	25.7278	10.3684	63.8401
2009	4.31	8.41	36.2471	18.5761	70.7281
Total	∑b=15.78	∑d=41.77	∑bd=131.8618	$\sum b^{2=}51.6536$	$\sum d^2=351.1351$

Correlation-coefficient between Deposit Rate (b) and Lending Rate (d)

$$fr_{bd} AX \frac{5 \mid 131.86 Z 15.78 \mid 41.77}{\sqrt{5 \mid 51.6536 Z (15.78)^2}\sqrt{5 \mid 351.1351 Z (41.77)^2}}$$

$$X \frac{659.30 Z 659.13}{\sqrt{258.268 Z 249.0084}\sqrt{1755.6755 Z 1744.7329}} X \frac{0.17}{\sqrt{9.2596}\sqrt{10.9426}} \quad X \frac{0.17}{10.065}$$

$= 0.0177 \quad (r_{bd})^2 = (0.0177)^2 = 0.0003$

Test of significance of correlation coefficient between Deposit Rate and Lending Rate

t- statistics under null hypothesis;

$$t \; X \frac{r_{bd}}{\sqrt{1 Z r^2_{bd}}} \mid \sqrt{n Z 2}$$

$\square \; t_{n-2}$

$$X \frac{0.0177}{\sqrt{1 Z 0.00031}} \mid \sqrt{5 Z 2} \quad X \frac{0.03066}{0.9998} X 0.031$$

Calculation of Correlation coefficient between Lending Amount and Average Interest Rate on Lending of HBL

Year	Lending amount (c)	Lending Rate (d)	cd	c^2	d^2
2005	13245.06	9.12	26.1744	175431614.4	83.1744
2006	15515.71	8.95	24.0755	240737256.8	80.1025
2007	17672.01	7.3	19.637	312299937.4	53.29
2008	19985.19	7.99	25.7278	399407819.3	63.8401
2009	25292.07	8.41	36.2471	639688804.9	70.7281
Total	∑C=91710.04	∑d=41.77	∑Cd=761054.20	$\sum c^{2=}$1767565433	$\sum d^2$= 351.1351

Correlation-Coefficient between Lending Amount (c) and Lending Rate (d)

$$(r_{cd}) \text{ X} \frac{n \quad cd \text{ Z} \quad c \quad d}{\sqrt{n \quad c^2 \text{ Z} f \quad c \text{Å}^2} \sqrt{n \quad d^2 \text{ Z} f \quad d \text{Å}^2}}$$

$$f r_{cd} \text{ AX} \frac{5 \mid 761054.20 \text{ Z} 91710.04 \mid 41.77}{\sqrt{5 \mid 1767565433 \text{ Z} 8410797468} \sqrt{5 \mid 351.1351 \text{ Z} 1744.7329}}$$

$$\text{X} \frac{\text{Z} 25457.37}{68357.96} \quad = -0.3724 \quad (r_{cd})^2 = (0.3724)^2 = 0.1387$$

Test of significance for correlation coefficient between Lending Amount and Interest Rate on Lending of HBL

t- statistics under null hypothesis;

$$t \text{ X} \frac{r_{cd}}{\sqrt{1 \text{ Z} r^2_{cd}}} \mid \sqrt{n \text{ Z} 2}$$

□ t_{n-2}

$$\text{X} \frac{\text{Z} 0.3724}{\sqrt{1 \text{ Z} 0.1387}} \mid \sqrt{5 \text{ Z} 2} \quad \text{X} \frac{\text{Z} 0.3724}{\sqrt{0.6276}} \mid \sqrt{3} \quad \text{X} \frac{\text{Z} 0.6450}{0.7922} \text{ XZ} 0.69$$

/t/= 0.69

Calculation of Correlation coefficient between Average Interest Rate on Deposit and Inflation Rate of HBL

Year	Deposit rate "b"	Inflation rate "e"	be	b^2	e^2
2005	2.87	4.5	12.915	8.2369	20.25
2006	2.69	8	21.52	7.2361	64
2007	2.69	6.4	17.216	7.2361	40.96
2008	3.22	7.7	24.794	10.3684	59.29
2009	4.31	12.9	55.599	18.5761	166.41
	∑b=15.78	∑e=39.50	∑be=132.044	$\sum b^2$=51.65	$\sum e^2$=350.91

$$(r_{be}) \text{ X} \frac{n \quad be \text{ Z} \quad b \quad e}{\sqrt{n \quad b^2 \text{ Z} f \quad b \text{Å}^2} \sqrt{n \quad e^2 \text{ Z} f \quad e \text{Å}^2}}$$

Correlation-coefficient between Deposit Rate (b) and Inflation Rate (e)

$$f r_{be} \text{ AX} \frac{5 \mid 132.044 \text{ Z} 15.78 \mid 39.50}{\sqrt{5 \mid 51.65 \text{ Z} (15.78)^2} \sqrt{5 \mid 350.91 \text{ Z} (39.50)^2}}$$

$$\text{X} \frac{660.2 \text{ Z} 623.31}{\sqrt{258.25 \text{ Z} 249.008} \sqrt{2197.44 \text{ Z} 1713.96}} \text{ X} \frac{49.89}{\sqrt{9.242} \sqrt{483.48}} \text{ X} \frac{49.89}{66.84}$$

= 0.8702 $(r_{be})^2 = (0.8702)^2 = 0.7572$

Test of significance for correlation coefficient between Interest Rate on Deposit and Inflation Rate t- statistics under null hypothesis;

$$t \text{ X} \frac{r_{be}}{\sqrt{1 \text{ Z} r^2_{be}}} \mid \sqrt{n \text{ Z} 2}$$

□ t_{n-2}

$$\text{X} \frac{0.8702}{\sqrt{1 \text{ Z} 0.7572}} \mid \sqrt{5 \text{ Z} 2} \quad \text{X} \frac{0.8702}{\sqrt{0.2428}} \mid \sqrt{3} \quad \text{X} \frac{1.5072}{0.4927} \text{ X} 3.06$$

Calculation of Correlation Coefficient between Deposit Rate and Risk-free Rate of HBL

Year	Deposit rate "b"	risk-free rate "f"	bf	b^2	f^2
2005	2.87	2.46	7.0602	8.2369	6.0516
2006	2.69	2.84	7.6396	7.2361	8.0656
2007	2.69	2.42	6.5098	7.2361	5.8564
2008	3.22	4.22	13.5884	10.3684	17.8084
2009	4.31	5.44	23.4464	18.5761	29.5936
	∑b=15.78	∑f=17.38	∑bf=58.2444	$\sum b^2$=51.6536	$\sum f^2$=67.3756

Correlation-coefficient between Deposit Rate (b) and Risk-free Rate (f)

$$(r_{bf}) \text{ X} \frac{n \quad bf \text{ Z} \quad b \quad f}{\sqrt{n \quad b^2 \text{ Z} f \quad b \text{Å}^2} \sqrt{n \quad f^2 \text{ Z} f \quad f \text{Å}^2}}$$

$$f r_{bf} \text{ AX} \frac{5 \mid 58.2444 \text{ Z} 15.78 \mid 17.38}{\sqrt{5 \mid 51.6536 \text{ Z} (15.78)^2} \sqrt{5 \mid 67.3756 \text{ Z} (17.38)^2}}$$

$$\text{X} \frac{291.222 \text{ Z} 274.256}{\sqrt{9.2596} \sqrt{34.8136}}$$

= 0.9449 $(r_{bf})^2 = (0.9449)^2 = 0.8928$

Test of significance for correlation coefficient between Interest Rate on Deposit and Risk-free Rate

t- statistics under null hypothesis;

t_{n-2}

$$t \text{ X} \frac{r_{bf}}{\sqrt{1 \text{ Z} r^2_{bf}}} \mid \sqrt{n \text{ Z} 2} \qquad \text{X} \frac{0..9449}{\sqrt{1 \text{ Z} 0.8928}} \mid \sqrt{5 \text{ Z} 2}$$

$$\text{X} \frac{0.9449}{\sqrt{0.1072}} \mid \sqrt{3} \quad \text{X} \frac{16.9656}{17.9534} \quad \text{X} \frac{1.6366}{0.3274} \text{ X} 4.99$$

Calculation of Correlation Coefficient between Lending Rate and Inflation Rate of HBL

Year	Lending Rate(d)	Inflation Rate (e)	de	d^2	e^2
2005	9.12	4.5	41.04	83.1744	20.25
2006	8.95	8	71.6	80.1025	64
2007	7.3	6.4	46.72	53.29	40.96
2008	7.99	7.7	61.523	63.8401	59.29
2009	8.41	12.9	108.489	70.7281	166.41
Total	∑d=41.77	∑e=39.50	∑de=329.279	$\sum d^2$=351.1351	$\sum e^2$=350.91

Correlation-coefficient between Lending Rate (d) and Inflation Rate (e)

$$(r_{de}) \text{ X} \frac{n \quad de \text{ Z} \quad d \quad e}{\sqrt{n \quad d^2 \text{ Z} f \quad d \text{Å}^2} \sqrt{n \quad e^2 \text{ Z} f \quad e \text{Å}^2}}$$

$$f r_{de} \text{ AX} \frac{5 \mid 329.279 \text{ Z} 41.77 \mid 39.50}{\sqrt{5 \mid 351.1351 \text{ Z} (41.77)^2} \sqrt{5 \mid 350.91 \text{ Z} (39.50)^2}}$$

$$\text{X} \frac{1646.395 \text{ Z} 1649.915}{\sqrt{1755.6755 \text{ Z} 1744.73} \sqrt{1754.55 \text{ Z} 1560.25}}$$

$$\text{X} \frac{\text{Z} 3.52}{\sqrt{10.94} \sqrt{194.30}} \quad \text{X} \frac{\text{Z} 3.52}{45.99}$$

= -0.0662 $(r_{de})^2$ =(-0.0662)^2 = 0.0044

Test of significance for correlation coefficient between Interest Rate on Lending and Inflation Rate

t- statistics under null hypothesis;

t_{n-2}

$$t \text{ X} \frac{r_{de}}{\sqrt{1 \text{ Z} r^2_{de}}} \mid \sqrt{n \text{ Z} 2} \quad \text{X} \frac{\text{Z} 0.0662}{\sqrt{1 \text{ Z} 0.0044}} \mid \sqrt{5 \text{ Z} 2} \quad \text{X} \frac{\text{Z} 0.1147}{0.9978} \text{ X}.115$$

$$\text{X} \frac{\text{Z} 0.0662}{\sqrt{0.9956}} \mid \sqrt{3}$$

Calculation of Correlation Coefficient between Lending Rate and Risk-free Rate of HBL

Year	Lending rate "d"	risk-free rate "f"	df	d^2	f^2
2005	9.12	2.46	22.4352	83.1744	6.0516
2006	8.95	2.84	25.418	80.1025	8.0656
2007	7.3	2.42	17.666	53.29	5.8564
2008	7.99	4.22	33.7178	63.8401	17.8084
2009	8.41	5.44	45.7504	70.7281	29.5936
Total	∑d=41.77	∑f=17.38	∑df=144.98	$\sum d^2$=351.135	$\sum f^2$=67.3756

Correlation-coefficient between Lending Rate (d) and Risk-free Rate (f)

$$(r_{df}) = \frac{n \quad df - d \quad f}{\sqrt{n \quad d^2 - d^2}\sqrt{n \quad f^2 - f^2}}$$

$$r_{df} = \frac{5 \times 144.98 - 41.77 \times 17.38}{\sqrt{5 \times 351.135 - (41.77)^2}\sqrt{5 \times 67.3756 - (17.38)^2}}$$

$$= \frac{-1.0626}{19.47} = -0.0525 \quad (r_{df})^2 = (-0.0525)^2 = 0.0028$$

Test of significance for correlation coefficient between Interest Rate on Lending and Risk-free Rate of HBL

t- statistics under null hypothesis;

$$t = \frac{r_{df}}{\sqrt{1 - r^2_{df}}} \times \sqrt{n - 2}$$

t_{n-2}

$$= \frac{-0.0525}{\sqrt{1 - 0.0525}} \times \sqrt{5 - 2} \qquad = \frac{-0.0525}{\sqrt{0.9475}} \times \sqrt{3} \quad = \frac{-0.09093}{0.9734} = -0.091$$

Calculation of Correlation Coefficient between Deposit Amount and Lending Rate of HBL

Year	Amount of deposit "a"	Lending rate "d"	ad	a^2	d^2
2005	24831.15	9.12	226460.1	616586010.3	83.1744
2006	26456.31	8.95	236784	699936338.8	80.1025
2007	29905.94	7.3	218313.4	894365247.3	53.29
2008	31805.31	7.99	254124.4	1011577744	63.8401
2009	34680.96	8.41	291666.9	1202768987	70.7281
	∑a=147679.70	∑d=41.77	∑ad=1227349	$\sum a^2$=4425234327	$\sum d^2$=351.1351

Correlation-coefficient between Deposit Amount (a) and Lending Rate (d)

$$(r_{ad}) \text{ X} \frac{n \quad ad \text{ Z} \quad a \quad d}{\sqrt{n \quad a^2 \text{ Z} f \quad a \text{Å}^2} \sqrt{n \quad d^2 \text{ Z} f \quad d \text{Å}^2}}$$

$$f r_{df} \text{ Å X} \frac{5 \mid 1227349 \text{ Z} 147679.70 \mid 41.77}{\sqrt{5 \mid 4425234327 \text{ Z} (147679.70)^2} \sqrt{5 \mid 351.1351 \text{ Z} (41.77)^2}}$$

$$\text{X} \frac{6136745 \text{ Z} 6168581.069}{\sqrt{316882610} \sqrt{10.9426}} \text{ X} \frac{\text{Z} 31836.069}{58885.20}$$

= -0.61186 $(r_{ad})^2$ =(-0.61186)^2 = 0.3744

Test of significance for correlation coefficient between Deposit Amount and Lending Ratet- statistics under null hypothesis;

$$t \text{ X} \frac{r_{ad}}{\sqrt{1 \text{ Z} r^2_{ad}}} \mid \sqrt{n \text{ Z} 2}$$

□ t_{n-2}

$$\text{X} \frac{\text{Z} 0.61186}{\sqrt{1 \text{Z} 0.3744}} \mid \sqrt{5 \text{ Z} 2} \quad \text{X} \frac{\text{Z} 0.61186}{\sqrt{0.6256}} \mid \sqrt{3} \quad \text{X} \frac{\text{Z} 1.05977}{0.7909} \text{ X Z} 1.34$$

/t/= 1.34

Calculation of Correlation Coefficient between Deposit Rate and Lending Amount of HBL

Year	Deposit rate "b"	Amount of loan advances " c"	bc	b^2	c^2
2005	2.87	13245.06	38013.3	8.2369	175431614.4
2006	2.69	15515.71	41737.3	7.2361	240737256.8
2007	2.69	17672.01	47537.7	7.2361	312299937.4
2008	3.22	19985.19	64352.3	10.3684	399407819.3
2009	4.31	25292.07	109009	18.5761	639688804.9
	∑b=15.78	∑c=91710.04	∑bc=300649.40	$\sum b^2$=51.6536	$\sum c^2$=1767565433

Correlation-coefficient between Deposit Rate (b) and Lending Amount (c)

$$(r_{bc}) \text{ X} \frac{n \quad bc \text{ Z} \quad b \quad c}{\sqrt{n \quad b^2 \text{ Z} f \quad b \text{Å}^2} \sqrt{n \quad c^2 \text{ Z} f \quad c \text{Å}^2}}$$

$$f r_{bc} \text{ AX} \frac{5 \mid 300649.40 \text{ Z} 15.78 \mid 91710.04}{\sqrt{5 \mid 51.6536 \text{ Z} (15.78)^2} \sqrt{5 \mid 1767565433 \text{ Z} (91710.04)^2}}$$

$$\text{X} \frac{1503247 \text{ Z} 1447184.43}{\sqrt{258.268 \text{ Z} 249.0084} \sqrt{8837827165 \text{ Z} 8410731437}} \text{ X} \frac{56062.5688}{\sqrt{9.2596} \sqrt{427095728.20}}$$

$$\text{X} \frac{56062.5688}{62886.68}$$

= 0. 8915 $(r_{bc})^2$ =$(-0.8915)^2$ = 0.7947

Test of significance for correlation coefficient between Deposit Rate and Lending Amount t- statistics under null hypothesis;

$$\text{X} \frac{0.8915}{\sqrt{1 \text{ Z} 0.7947}} \mid \sqrt{5 \text{ Z} 2}$$

t_{n-2}

$$t \text{ X} \frac{r_{bc}}{\sqrt{1 \text{ Z} r^2{}_{bc}}} \mid \sqrt{n \text{ Z} 2} \quad \text{X} \frac{0.8915}{\sqrt{0.2053}} \mid \sqrt{3} \quad \text{X} \frac{1.5441}{0.4531} \text{X} 3.41$$

Calculation of Correlation Coefficient between Inflation Rate and Risk-free Rate of HBL

Year	Inflation rate "e"	risk-free rate "f"	ef	e^2	f^2
2005	4.5	2.46	11.07	20.25	6.0516
2006	8	2.84	22.72	64	8.0656
2007	6.4	2.42	15.488	40.96	5.8564
2008	7.7	4.22	32.494	59.29	17.8084
2009	12.9	5.44	70.176	166.41	29.5936
	∑e=39.50	∑f=17.38	∑ef=151.948	$\sum e^2$=350.91	$\sum f^2$=67.3756

Correlation-coefficient between Inflation Rate (e) and Risk-free Rate (f)

$$(r_{ef}) \text{ X} \frac{n \quad ef \text{ Z} \quad e \quad f}{\sqrt{n \quad e^2 \text{ Z} f \quad e \text{Å}^2} \sqrt{n \quad f^2 \text{ Z} f \quad f \text{Å}^2}}$$

$$f r_{ef} \text{ Å X} \frac{5 \mid 151.948 \text{ Z} 39.50 \mid 17.38}{\sqrt{5 \mid 350.91 \text{ Z} (39.50)^2} \sqrt{5 \mid 67.3756 \text{ Z} (17.38)^2}}$$

$$\text{X} \frac{759.74 \text{ Z} 686.51}{\sqrt{1754.55 \text{ Z} 1560.25} \sqrt{336.878 \text{ Z} 302.0644}}$$

$$\text{X} \frac{73.23}{\sqrt{194.30} \sqrt{34.8136}} \quad \text{X} \frac{73.23}{82.24}$$

$= 0.89$ $(r_{ef})^2 = (-0.89)^2 = 0.7921$

Test of significance for correlation coefficient between Inflation Rate and Risk-free rate

t- statistics under null hypothesis;

$$t \text{ X} \frac{r_{ef}}{\sqrt{1 \text{ Z} r^2_{ef}}} \mid \sqrt{n \text{ Z} 2}$$

□ t_{n-2}

$$\text{X} \frac{0.89}{\sqrt{1 \text{ Z} 0.7921}} \mid \sqrt{5 \text{ Z} 2} \quad \text{X} \frac{0.89}{\sqrt{0.2079}} \mid \sqrt{3} \quad \text{X} \frac{1.5415}{0.4559} \text{ X} 3.38$$

Calculation of Multiple Correlation Coefficient of different variables of HBL

Variables	*Coefficient of correlation*	*Coefficient of determination*
r_{ab}	0.4271	0.1824
r_{bd}	0.0177	0.0003
r_{cd}	-0.3724	0.1387
r_{be}	0.8702	0.7572
r_{bf}	0.9449	0.8928
r_{de}	-0.0662	0.0044
r_{df}	-0.0525	0.0028
r_{ad}	-0.6118	0.3743
r_{bc}	0.8915	0.939
r_{ef}	0.8904	0.7928

$$fR_{b.ad} AX \sqrt{\frac{r_{ab}^{\ 2} \Gamma r_{bd}^{\ 2} Z 2 r_{ab} r_{bd} r_{ad}}{1 Z r_{ad}^{\ 2}}}$$

Multiple Correlation Coefficient

Where,

$fR_{b.ad} AX$ Multiple correlation coefficient assuming variable “b” (deposit rate) as dependent variable and other two variables variable “a” and variable “d” (i.e. deposit amount and lending rate) as independent variables.

r_{ab}= correlation coefficient between variable “a” and “b” = 0.4271

r_{bd}= correlation coefficient between variable “b” and “d” = 0.0177

r_{ad}= correlation coefficient between variable “a” and “d” = -0.6118

$(r_{bd})^2 = (0.0177)^2 = 0.0003$

$(r_{ab})^2 = (0.4271)^2 = 0.1824$

$(r_{ad})^2 = (-0.6118)^2 = 0.3743$

$$fR_{b.ad} AX \sqrt{\frac{0.1824 \Gamma 0.3743 Z 2 \mid 0.4271 \mid 0.0177 \mid Z 0.6118}{1 Z 0.3743}}$$

$$X \sqrt{\frac{0.5659}{0.8257}} X \sqrt{0.7256} X 0.5265$$

Multiple determination

$$R^2_{b.ad} = R_{b.ad} \times R_{b.ad} = 0.5265 \times 0.2772$$

Multiple Correlation Coefficient $$R_{d.bc} = \sqrt{\frac{r_{db}^2 + r_{dc}^2 - 2 r_{db} r_{dc} r_{bc}}{1 - r_{bc}^2}}$$

$$R_{d.bc} = \sqrt{\frac{0.0003 + 0.1387 - 2 \times 0.0177 \times 0.3724 \times 0.8915}{1 - 0.939}}$$

$$= \sqrt{\frac{0.139 - 0.01175}{0.1356}} = \sqrt{\frac{0.12725}{0.1356}} = \sqrt{0.8874} = 0.7875$$

Multiple determination

$$R^2_{d.bc} = R_{d.bc} \times R_{d.bc} = 0.7875 \times 0.6201$$

Multiple Correlation $$R_{b.ef} = \sqrt{\frac{r_{be}^2 + r_{bf}^2 - 2 r_{be} r_{bf} r_{ef}}{1 - r_{ef}^2}}$$

$$R_{b.ef} = \sqrt{\frac{0.7572 + 0.8928 - 2 \times 0.8702 \times 0.9449 \times 0.8904}{1 - 0.7928}}$$

$$= \sqrt{\frac{1.65 - 1.4643}{0.2072}} = \sqrt{\frac{0.1857}{0.2072}} = \sqrt{0.8962} = 0.9466$$

Multiple determination

$$R^2_{b.ef} = R_{b.ef} \times R_{b.ef} = 0.9466 \times 0.8962$$

Multiple Correlation $$R_{d.ef} = \sqrt{\frac{r_{de}^2 + r_{df}^2 - 2 r_{de} r_{df} r_{ef}}{1 - r_{ef}^2}}$$

$$f_{R_{d.ef}} = \sqrt{\frac{0.00438 - 0.002756^2 + 0.0662 + 0.0525 + 0.8904}{1 + 0.7928}}$$

$$\sqrt{\frac{0.007136 + 0.0062}{0.2072}} \quad \sqrt{\frac{0.0009468}{0.2072}} \times \sqrt{0.00456} \times 0.067$$

Multiple determination

$$f_{R^2_{d.ef}} = f_{R_{d.ef}} \times f_{0.0670} \times 0.0045$$