

**PORTFOLIO ANALYSIS OF LISTED JOINTS VENTURES  
BANKS**

**Submitted by:**

**Om Kumar Maharjan**

**Roll No: 337/061**

**Regd No: 2436-97**

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## DECLARATION

I hereby declare that the work reported in this thesis entitled “**Portfolio Analysis of Listed Joints Ventures Banks**” submitted to Office of the Dean, Faculty of Management, Tribhuvan University, is my original work done in the form of partial fulfillment of the requirement for the Master’s Degree in Business Study (M.B.S.) under the supervision of **Shnehalata Kafle** of Shanker Dev Campus.

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Researcher

Om Kumar Maharjam

TU Regd. No. 2436-97

Roll No. : 337/061

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I have tried to cover all the possible matters that I felts, important to sum up the “**Portfolio Analysis of Listed Joints Ventures Banks**”. I am hopeful that this task will be helpful to the students of business studies and to those who want to make further researchers under this topic.

**Om Kumar Maharjan**

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# **CHAPTER-I**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

Based on political map, Nepal lies on south Asia as a landlocked nation. The total area of the country is 147848 square k.m. According to the population census of 2001 Nepal's population is 23.5 million. Hill region covers 42% of the total land of the nation .Share of population of this region is 44.3%. Suitable land for cultivation is 40%. Among 22,7 million people of the country 85.80% people live in rural areas. Per capita income of the average Nepali is US \$ 237 according to the Central Bureau of statistics (2003).

Uprety (2000) states the economic growth in Nepal is primarily concentrated in urban areas particularly in Kathmandu valley neglecting the vast rural areas. Many programs have been implemented for the poverty alleviation in Nepal. But only micro-finance program is seen as a poor targeted rural based program. In Nepal agriculture based cooperatives were initiated in 1950s as a first step in micro -finance and poverty alleviation rural based program was initiated as a small farmers development program (SFDP) on pilots the Dhanusa and Nuwakot encouraged policy makers to expand rural based micro-finance program. Government started to rethink for delivery mechanism of the micro finance.

In Nepal, there are different kinds of financial institution which are fulfilling the credit needs to the different target people. The nature and scope of such institutions varies according to their service, such as Nepal Industrial Development Corporation has been established to provide credit for the medium and large-scale industries. Agriculture Development Bank (ADB) has been set up to provide credit for agriculture as well as small -scale industries. Commercial bank has been established to provide credit to agriculture, Industries, trade, and other.



Similarly other joint venture and private banks are also established to provide credit facilities.

joint venture banks are major financial institutions which occupy quite an important place in the framework of every economy because they provide capital for the development of industry, trade, business and other resources deficit sector by investing the saving collected as deposits. . Investment portfolio is one of the such tool that help for proper utilization of resources of joint venture bank. Thus, JVBs how become the heart of financial system. A key factor in the development if the country is the mobilization of domestic resources and their investment for productive use to the various sector. To make it more effective, JVBs formulate sound investment policies, which help maximizing quality and quantity of investment and eventually contribute to the economic growth of a country.

In finance, a portfolio is an appropriate mix of or collection of investments held by an institution or a private individual. Investment decision depends upon two factors i.e. risk and return. Risk is the fluctuation of actual returns and expected returns. The basis objective of portfolio analysis is to minimize risk at the given rate of return. The reduction of risk is possible by investing in two or more securities is called portfolio.

By owning several assets, certain types of risk (in particular specific risk) can be reduced. The assets in the portfolio could include stocks, bonds, options, warrants, gold certificates, real estate, production facilities, or any other item that is expected to retain its value

In 1952, Harry M. Markowitz published a landmark paper that is generally viewed as the origin of the modern portfolio theory approach to investing. No body is ready to bear the risk without any return but to have returned one must ready to face some risk, portfolio diversification is necessary to minimize the risk at the given rate of return. Portfolio management is unconcerned with efficient management of portfolio investment in financial assets including shares and debentures of companies. A portfolio of an

individual or corporate unit is the holding of securities and investment in financial assets. These holding are the result of individual preferences and decision regarding risk and return. The process of portfolio management is closely and directly linked with the process of decision making correctness of which can not be ensured in all cases. for example portfolio management of bank assets basically means allocation of funds to different degree of risk and carrying rates of return in such a way that balance the conflicting goal of maximum yield and minimum risk .

The portfolio theory is covered with the selection of optimal portfolio i.e. portfolio that provides the highest possible return for any specified level of risk or the lowest possible risk for any specified rate of return. Integrated and speedily development of the country is possible only when competitive banking and financial service reaches risk and concerns of the country. Successful formulation and effective implementation of investment policy is the prime requisite for the successful performance of the banks and other financial institutions. Good investment policy has a positive impact on economic development of the country and vice versa. A systematic investment process should be followed to win the stock market investment process describes how an investor should go about making decision with regard to what marketable to invest in how extensive the investment should be and when the investment should be made.

Portfolio construction identifies those specific assets in which to invest determine the proportion of the investor's wealth. Diversification should be done to minimize the risk and maximize the return. Portfolio performance involves determining periodically how the portfolio performs in terms of not only the return earned but also the risk experienced by the investor.

The systematic development and implementation of an investment strategy, the purpose of which is to achieve the investor's financial goals, open portfolio management is mistaken for the simple buying of new securities and selling current holdings.

In finance a portfolio is a collection of investments held by an institution or a private individual. In building up an investment portfolio a financial institution will conduct its own investment analysis whilst a private individual may make use of the service of a merchant bank which offers portfolio management. Holding a portfolio is a part of an investment and risk limitation strategy called diversification.

Portfolio means "A collection of company shares and other investment that are owned by a particular person or organization" (Cambridge International Dictionary English, 1995)

A portfolio simply represents the practice among the investor of having their funds in more than one asset. The combination of investment assets is called portfolio. All the economic activities of each and every country.

Portfolio management is the process of selecting a bundle of securities that provides the investing organization a maximum yield for a given level of risk. Portfolio management can be also taken as risk and return management it aims to determine appropriate assets mix which attains optimal level to risk and return. Portfolio technically known as efficient portfolio is a superior portfolio. The efficient portfolio is a function of not only risk and return of individual assets included but also the effect of relationship among the assets on the sum total of portfolio risk and return.

The concept of banking system was introduced in Nepal with the establishment of Nepal Bank Ltd. in 1937 A. D. but the financial scenario of Nepal changed with the establishment of joint venture bank in 1984 A. D. Nabil Bank Ltd. is the first joint venture bank introduced in Nepal. Since the joint venture banks introduced in Nepal, the set up of joint venture banks are increasing day by day and domestic banks like Nepal Bank Ltd. And Rastriya Banijya bank no longer been able to enjoy monopoly. There are cut throat competition among these banks, which is healthy sign for the economic development of the country. Among the established commercial banks in NEPSE only four commercial banks are taken for this study.

### List of Licensed Commercial Banks in Nepal

S.	Commercial bank	Established date	Head office
1	Nepal Bank Limited	1937/11/15	Kathmandu
2	Rastriya Banijya Bank	1966/01/23	Kathmandu
3	Agriculture Development Bank	1968/01/02	Kathmandu
4	NABIL Bank Limited	1984/07/16	Kathmandu
5	Nepal Investment Bank Limited	1986/02/27	Kathmandu
6	Standard Chartered Bank Nepal	1987/01/30	Kathmandu
7	Himalayan Bank Limited	1993/01/18	Kathmandu
8	Nepal SBI Bank Limited	1993/07/07	Kathmandu
9	Nepal Bangladesh Bank Limited	5/6/1994	Kathmandu
10	Everest Bank Limited	1994/10/18	Kathmandu
11	Bank of Kathmandu Limited	1995/03/12	Kathmandu
12	Nepal Credit and Commerce	1996/10/14	Siddharthanagar, Rupendehi
13	Lumbini Bank Limited	1998/07/17	Narayangadh, Chitawan
14	Nepal Industrial & Commercial	1998/07/21	Biaratnagar, Morang
15	Machhapuchhre Bank Limited	2000/10/03	Pokhara, Kaski
16	Kumari Bank Limited	2001/04/03	Kathmandu
17	Laxmi Bank Limited	2002/04/03	Birguni, Parsa
18	Siddhartha Bank Limited	2002/12/24	Kathmandu
19	Global Bank Ltd.	2007/01/02	Birguni, Parsa
20	Citizens Bank International Ltd.	2007/6/21	Kathmandu
21	Prime Commercial Bank Ltd	2007/9/24	Kathmandu
22	Sunrise Bank Ltd.	2007/10/12	Kathmandu
23	Bank of Asia Nepal Ltd.	2007/10/12	Kathmandu
24	Development Credit Bank Ltd.	2001/01/23	Kamaladi, Kathmandu
25	NMB Bank Ltd.	1996/11/26	Babarmahal, Kathmandu

Joint venture bank is a new innovation in finance and it is on growing stage, mostly in developing countries. Joint venture means "a business contact of management effort between two persons, companies or organization involving risk and benefit sharing." Joint venture is the process of sharing risk and return from a specific venturing. The first Joint venture bank was Nepal Arab Bank Ltd. (Nabil). It was established in 1984. Later the following joint venture banks were established, respectively.

- ) Nabil Bank Ltd. 1984
- ) Standard Chartered Bank Ltd 1985
- ) Nepal Indoseuz Bank in 1986
- ) Nepal Grindlays Bank in 1987
- ) Himalayan Bank in 1993
- ) Nepal SBI Bank in 1993
- ) Nepal Bangladesh Bank in 1994
- ) Everest Bank in 1994
- ) Bank of Kathmandu 1995
- ) Nepal bank of Ceylon in 1996

In this past, general introduction of the banks under study is being attempted to furnish for the easy reference of the samples to the research.

- i. NABIL Bank Ltd.
- ii. Nepal SBI Bank Ltd.
- iii. Bank of Kathmandu Ltd.
- iv. Standard Charted Bank

### **NABIL Bank Ltd.**

NABIL Bank Ltd., the first joint venture bank in Nepal which was established in 1984 under the company act 1964. Dubai bank Ltd (DBL) was the initial foreign joint venture bank partner with 50% equity investment. The share owned by DBL were transferred to Emirate Bank International Ltd. (EBIL) Dubai. Later on EBIL sold its entire stock to National Bank Ltd., Bangladesh (NBL). Hence 50% so the current configuration given of follows;

- i. National bank ltd, Bangladesh 50%
- ii. Nepal Industrial Development Corporation NIDC 10%

- iii. Rastriya Beema Sunsthan 9.66%
- iv. Nepal stock exchange (NEPSE) 0.34%
- v. Nepalese public 30%

Authorized capital and paid of capital of Nabil Bank Ltd. are Rs. 500 million and Rs. 491.6544 million.

**ii. Nepal SBI Bank Ltd.**

Nepal SBI Bank Ltd. was established in 1993 under the company act 1964 this is the joint venture of State Bank of India and Nepalese promoter. This bank is managed by State Bank of India under the joint venture and technical service agreement signed with Nepali promoters viz employee provident fund and agriculture development Bank Nepal. share holding pattern of the bank is 50% share owned by state bank of India Nepalese promoters includes 20% government organization and 30% of general public, the main objective of the bank is to carryout modern banking business on the country. The bank is one of the largest shareholder based company and the bank started its banking operation on 8th July 1993. the banks authorized capital issued capital and paid up capital were Rs 240 , Rs. 120 and Rs. 119.82 million respectively . in the initial period at the end of year 2001\2002 authorized capital issued capital and paid up capital were Rs. 1000 and Rs. 500 abd Rs 424.89 million respectively.

**iii. Bank of Kathmandu**

Bank of Kathmandu Ltd. was established in 1994 under the company act 1964. This bank was established as the joint venture investment of SIAM commercial bank public company Ltd Thailand. Authorized, issued and paid up capital were Rs. 240 , Rs. 120 Rs. 42 million respectively at the initial period. At the time of establishment SIAM commercial bank holds 50% share at this bank but later on it holds over its 25% share to Nepalese citizen in 1998 A. D. At the end of year 2001/2002 authorized issued and paid up capital were Rs. 1000 Rs. 58 and Rs. 463.58 million respectively.

#### **iv. Standard Chartered Bank Ltd.**

Standard Chartered Bank Ltd. the second joint venture bank in Nepal. Which was established in 1985 under the company act 1964. ANG Grindlays Bank PLC London in the foreign joint venture partner with 50% equity investment. Now the bank has its partner of annexation of standard chartered, U.K. by standard chartered banking Group. Among the remaining 50% equity share of SCBL Bank Ltd. 33.34% share are held by commercial banks and 16.66% share by Nepalese public and other financial institution. Authorized capital and paid up capital of standard chartered bank of Nepal Ltd. are Ts.339.5488 million.

#### **1.5 Statement of Problem**

The main problem is almost all underdeveloped countries like Nepal is that capital formation and proper utilization. In such countries, JVBs have more responsibilities to avoid above problem and there by contribute to the national economy. The problem of investment and lending has become very serious for developing countries like Nepal. The development of country is directly related to the volume of investment in productive sectors, which is also obtained from JVBs. The credit policy the interest rate ceiling, discount rate policy, certain percentage of deposit to be lent to productive sector. All these policy effect investment decision of the JVBs.

JVBs are found to be making investment only on short term basis against movable merchandise. There is hesitation to invest on long term projects, they are much more safety minded. So they follow conservative loan policy. There is also a criticism that JVBs have served only richer communities not the poor with the prevailing economic recession political instability and Maoist's violence in the country, there has been lower investment in the productive sector. Lower volume of investment is causing lower growth of gross domestic product, hence foreign trade deficit is increasing day by day. Nepal is known as a capital scare country. It has lower saving rate and as a consequence of which investment rate is also low. The low investment rate has

also constrained the growth rate of GDP increasing saving and investment and reducing the consumption there by farther alliterating the place of development is the challenge of the country.

Now all financial sectors have been suffering from cut throat competition. So, Nepalese JVBs can not escape from such condition. Because of liberal economic policy, many new banks are coming in existence day by day which creates the threatens for existing bank to be competitive. There are various problems in resource mobilization by financial institution in Nepal. The main problem is poor investment climate prevailing in Nepal due to heavy regulatory procedure uncertain government policy, NRB's directives insecure climate etc. Undoubtly reduce investment demand below when otherwise would be unsecured loan and investment may cause the liquidation of those institutions.

After the restoration of democracy Nepal has adopted more liberal and open economic policies. The process of economic liberalization and reforms in financial sector introduce in the early 1980's has led to significant changes in the banking industry. The open and liberal policy of government in financial to do has helped in establishing many banks and financial institutions in the country. These banks have contributed towards introducing new technology, new banking system and efficient service delivery on the country. Now a day's JVBs do not seem to be capable to invest their funds in more profitable sectors where there is low risk. They are found to more interested in investment less risky and liquid sectors i.e. treasury bills, development banks, national saving share and debenture etc. This is due to sound investment policy of JVBs and lack of portfolio management. JVBs have not formulated their investment policy in an organized manner. They do not have consideration towards portfolio optimization. They just relay upon the instruction and guideline of Nepal Rastra Bank. They do not have their own clear vision towards investment portfolio. They do not try to pay due attention towards proper matching of the deposit and investment portfolio.



Bank has to invest its source indifferent productive sector of the investment alternatives to earn profit but there is uncertainty of profit which creates risk to the organization. So every JVBs has to diversify their investment to minimize risk. But portfolio management activities of JVBs are in developing stage. There are various reason behind not suing such activities openly by JVBs such as awareness about portfolio management and it's usefulness, hesitation of taking risk, lake of proper techniques to run such activities in the best and successful manner less developed capital market, very limited opportunity for exercising the portfolio management. Nepal Rastra Bank has also played vital role to make JVBs as well as financial institutions to invest their funds in a good sector, which affect the investment portfolio. NRB has imposed many rules and regulations, so JVBs can have sufficient liquidity and security banking competition is increasing day by day but investment opportunity is not comparatively extended.

Under such situation, the present study will try to analyze the investment of JVBs portfolio management of JVBs in their investment, return on various types of investment, portfolio risk return and performance towards investment. Therefore this study will deal with the following issues.

1. Is portfolio management efficient on JVBs?
2. How for JVBs have been able to mobilize and utilize domesticates resources?
3. How does bank portfolio behave?
4. How do JVBs manage their risk and return using portfolio diversification?
5. Does the investment decision effect the total earning of the bank?
6. Which bank has largest portfolio return?
7. What is the relationship investment with total deposits, loan and advance, net income etc.?

8. Which banks has the largest degree of financial risk measured in terms of portfolio risk?
9. What is the trend of investment in different assets?

### **1.6 Significance of the Study**

The main significance of this study of investment portfolio analysis of JVBs is to help how to minimize risk on investment and maximize return through portfolio analysis similarly, the study of JVBs, investment trend, risk return pattern, portfolio management, credit management and effect of investment decision on earning will strive to disclose the internal weakness of the bank and furnish the ideal for improvement. JVBs don't have clear view towards effective investment. They want making investment only short term basis. There is hesitation to investment on long term project because they are much more safety minded. So they follow traditional and ineffective investment policy. Similarly, they do not seem to be capable to invest their funds in more profitable sector. They are found to more interest in investment in less risky and highly liquid sectors. The investment analysis of any organization flashes its investment policy. Sound investment policy makes a good impact on the economy of the country. The success and prosperity of any financial institution relies heavily upon the successful investment of its available resource into the profitable sector. Banks and other financial institution are playing vital role in the economic development of the country. So if there is insufficiency of banking and financial facilities, the growth of the economic development becomes slow specially, JVBs provide different facilities to the people engaged in trade, commerce, industry and so on. That is why, they are being the means for the upliftment of the society. Since, the importance of banks is highly appreciated, it needs proper attention to run successfully. Successful formulation and effective implementation of investment policy is the prime requisition for the successful performance of any organization. The major significance of the study are as follows

) It examines the investment, loans and advances portfolio of JVBs.

- ) It analyzes risk and return of JVBs.
- ) It evaluates the financial performance of selected JVBs of Nepal.
- ) It examines the existing situation of portfolio management of JVBs.
- ) It provides the literature to the researcher who wants to carry on future research in this field.

### **1.7 Objective of the Study**

The main objective of this study is to identify the situation of portfolio management of JVBs. Investment decision is one of the major decision functions of financial management. It emphasizes that the analyze examines the interprets portfolio technique followed by JVBs on their investment in various sector. This study focuses whether the JVB' properly followed portfolio concept to take investment decision or not. Hence, the major objectives of this study are given below.

1. To examine the existing situation of portfolio management of JVBs under study.
2. To evaluate comparative financial performance of selected JVBs in terms of investment strategies.
3. To find out trend of investment in different banks.
4. To analyze how JVBs manage their risk and return on investment using portfolio concept.
5. To analyze the investment loan advance portfolio of JVBs.

### **1.5 Limitations of the Study**

- ) To examine financial position of JVBs only certain ratios related with investment are related.
- ) The study only covers a period of ten fiscal years.
- ) The study is mainly based on secondary data. Consequently the result depends on the reliability of secondary data.

- ) There are a lot of factors that affect investment decision of JVBs. However, this study concentrates only on those factors, which are related with investment portfolio analysis and available in the form required for the analyzing different issues.
- ) Given the unavailability of various relevant returns on investment, it has not been possible to estimate portfolio risk and return. However, as an alternative, the returns on various investments has estimated from the data available in the financial statement of banks.
- ) The financial statement of all JVBs published by them are not readily available. So, only four banks i.e. NABIL Bank Ltd., Nepal SBI Bank Ltd., Bank of Kathmandu Ltd., Standard Chartered Bank are taken for the study,

## **1.6 Organization of the Study**

The study has been organized into five chapters each denoted to some aspects of the study of clearing and settlement system. The title of each chapter is as follows.

- ) The first chapter is introduction chapter, which deals with general background, meaning, statement of problem , objective of the study, significance of the study, limitations of the study and common hypothesis about the study.
- ) Second chapter, deals with the review of available literatures in the field of study being conducted. This includes conceptual review of popular models of portfolio, review of journal and articles and review of previous thesis.
- ) Third chapter explains the research methodology used in study, which includes research design, population and sample source of data, data collection techniques, data analysis tools.

) Fourth chapter is data presentation and analysis, it is the major part of the whole study in which all collected relevant data are analyzed and interpreted by the help of different financial and statistical tools.

) The fifth and final chapter is the summary, conclusion and recommendation. It includes summary of the study, conclusion of the major findings and recommendation for further improvement.

Besides this chapter, bibliography and appendixes will also present at the end of the thesis. Table of contents, list of table list of figure abbreviations are included in the front part of this thesis report.

## **CHAPTER-II**

### **REVIEW OF LITERATURE**

This chapter is considered of the major related literature about the portfolio management and related studies. Every possible effort has been made to grasp knowledge and information that are available from libraries, documents and collection center, Nepal Rastra Banks Nepal stock exchange center, security board, other information managing bureaus and concerned JVBS. It provides the foundation for developing a comprehensive theoretical framework and knowledge of the status of the relevant to the field of research in order to explore the relevant and true facts for the reporting purpose. Since, there are not so much adequate study materials related with this topic published in Nepal. This study has to refer almost all the books related with this topic published in other countries than Nepal. The concept of this portfolio management and its analysis is clear from the following studies:

#### **2.1 Conceptual Review**

Portfolio management is a method of selecting a bundle of securities the provides to the investing organization a minimum yield for a given level of risk. "Portfolio construction identifies these specific assets in which to invest determine the proportion of the investor's wealth. Diversification should be done to minimize the risk and maximized the return. Portfolio performance involves determining periodically how the portfolio performs in terms of not only the return earned, but also the risk experienced by the investor".

Investment risk can be reduced by including more than one alternative categories of assets in the portfolio and by including more than one assets form each category. Hence diversification is essential to the creation of an efficient investment because it can reduce the variability of returns around the expected return. This diversification may significantly reduce risk without a corresponding reduction in the expected rate of return on the portfolio.

Portfolio management can be also be define as aggregation and management of a diverse portfolio of supply resources which will act as a hedge. Against various risks that may affect specific resource. Under a more market driver powers sector with a power pool or pool co wholesale market structure, a portfolio managers would aggregate and manage a divers portfolio of spot market purchase, contracts for difference futures contracts and other market hedging type contracts and mechanisms .

Portfolio mgmt of banks assets basically means allocation of fund to different components of banking assets having different degrees of risk and varying rate of return in a way that balance the conflicting goal of maximum yield and minimum risk . When the processes of portfolio management of bank assets are done various factors such as availability of fund, liquidity requirement, central banks policy etc. It should be considered. As the task of portfolio management of bank assets is to be carried out within the given macro economic environment. The manager should carefully watch related macro economic indicator such as interest rate inflation rate national income, saving ratio etc.

Portfolio management refers to an investment that combines several assets the modern portfolio theory explains the relationship between assets risk and return. The theory is founded on the mechanics of measuring the effect of asset on risk and return of portfolio. Portfolio investment assumes that the mean and variance of returns are the only two factors that the investor cares. Bases on this assumption, we can say that rational investor always prefers the highest possible return for a given level of risk or the lowest possible level of risk for a given amount of return. Portfolio, technically known as efficient portfolio, is a superior portfolio. The efficient portfolio is a function of not only risk and return of individual asset. Included but also the effect of relationship among the assets on the sum total portfolio risk and return. The portfolio return is straight weighted average of the individual assets. But the portfolio risk is not the weighted average of the variance of return of the individual assets. The

portfolio risk is affected by the variance of return as well as the covariance between the return of individual assets included in the portfolio and their respective weights.

Portfolio analysis considers the determination of future risk and return in holding various bundles of individual securities. Portfolio expected return is a weighted average of the expected return of individual securities but portfolio variance is a sharp contrast, can be something less than a weighted average of security variance. As a result, an investor can something reduce portfolio risk by adding another security with greater individual risk than any other security in the portfolio.

### **2.1.1 The Expected Rate of Return**

The expected rate of the portfolio is the weighted average of the expected returns of the individual asset in the portfolio. The weights are the proportion of the investor wealth invested in each asset, and sum of the weight much be equal one.

The expected rate of return on the portfolio is calculated by as follows

$$R_p = W_A R_A + W_B R_B + \dots + W_N R_N$$

Where,

$R_p$  = Expected portfolio return.

$W_A$  = Weight of investment, invested in asset A

$R_A$  = Expected return for assets A.

$W_B$  = Weight of investment, invested in asset B.

$R_B$  = Expected return for asset B.

### **2.1.2 Portfolio Risk**

The portfolio risk is measured by either variance or the standard deviation of returns. Generally, the portfolio risk is less than the weighted



average of the standard deviation of individual securities. The reason is that it ignores the relationship or covariance between the returns of two securities.

"The portfolio risk is affected by the variance of return as well as the covariance between the return of individual assets included in the portfolio and respected weight."

The variance of returns from portfolio made up an asset is defined by following equation.

$$\text{Variance } (\sigma_p^2) = w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2w_A w_B \cdot \text{Cov. } (r_A, r_B)$$

$$\sigma_p = \sqrt{w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2w_A w_B \cdot \text{Cov. } (r_A, r_B)}$$

Where,  $\sigma_p$  = standard deviation of portfolio rate of return

$\text{Cov. } (r_A, r_B)$  = covariance of returns between assets A and B

The covariance is related to correlation coefficient as shown in equation.

$$\text{Cov. } (r_A, r_B) = P_{AB} \sigma_A \sigma_B$$

$P_{AB}$  = Correlation coefficient between variables A and B.

### 2.1.3 Basic Assumption of Portfolio Analysis

The portfolio selection model developed by Markowitz. This model is based on several assumptions regarding investor's behavior.

1. Investment considers each investment alternative as being represented by a probability distribution of expected returns over same holding period.
2. Investors are based their decisions solely on expected return and variance of return only.
3. Investors estimates risk on the basis of the variability of expected returns
4. Investors maximize one period expected utility and posse's utility curve, which demonstrates diminishing marginal utility of wealth.

5. for a given level of risk, the investor prefer higher return to lower returns for any given level of rate of returns

According to Markowitz, the investor should maximize expected return. This rule implies that the non-diversified single security portfolio with the highest expected return is the most desirable portfolio.

#### **2.1.4 Objective of Portfolio Management**

There are several objectives which should be considered as a basis to an executed investment programme the objective of portfolio analysis is to develop a portfolio these has a maximum return at whatever level at risk, the investor seems appropriate. We can point out the following as the main objective of portfolio management.

- ) To safety or security of an investment
- ) To stable of the income
- ) To easy marketability of asset.
- ) To ever liquidity.
- ) Minimization of risk
- ) Maximization of return.
- ) To the tax benefit.
- ) To get income by interest and dividends

#### **2.1.5 Portfolio Management Policies**

##### **A. Aggressive Policy**

This policy gives more emphasis on yields of securities. This policy assumed that the market is strong and rising, that common stocks will be best outlets for the portfolio in rising market. This policy depends more on short-terms source of fund.

## **B. Defensive Policy**

This policy gives more emphasis on safety of principal amount. This policy will be useful when it is suspected that the market will decline in near future. Bonds and preferred stocks are defensive types of securities. This policy depends more upon long term source of fund.

## **C. Moderate Policy**

This policy suggests for the construction of balanced portfolio of various types of securities. It is the hedge of aggressive and defensive policy or hedge against a rise or fall in the stock market.

## **D. Income us. Growth policy**

The income policy gives more emphasis upon maximization of current income and attaches insignificant importance to capital gain and growth. The growth policy gives more emphasis on the capital appreciation of the portfolio.

### **2.1.6 Factor affecting Portfolio decisions**

**Amount of Decision:** while determining the investment portfolio the finance manager should actually consider the amount of fund available with organization trading and manufacturing organization deal in securities only for the purpose of best utilization of their available surplus cash resource. The amount of surplus funds available with them will therefore decide the quantum of their investment in securities.

**Objective of Investment Portfolio:** While determining the investment portfolio we should be clear about objective of making investment in securities. The objective may differ from organization to employees can think of having in its investment portfolio only such securities which can assure safety of the fund and its returns.

**Selection of Investment:** This is an essential decision which a finance manager has to take. He has to decide the kind of investment in which he has to put his fund. The selection of investment involves deciding about the type of

securities, proportion between fixed and variable yield securities, selection of industries, selection of companies etc.

**Timing of Purchase:** To maximize the profit it is not only important for the finance manager to buy the right security but it is also equally important to buy and sell it at the right time. It is the most intricate and complex decision for finance.

## 2.2 Review of Articles

There are not so many articles published relation to portfolio management of JVBs of Nepal. Some related articles have been mentioned. Mr. Shree Prasad Poudel has given short note, 'Government Security Markets National and Development in Nepal on Nepal Rastra Bank Samachar in 2059. It has concluded that the security markets are key point of the financial system. Debt securities market in the Nepal is highly dominated by government. Debt statistics shows that Nepal remained free nation till 1950's from the beginning of 1960's foreign loans and domestic bonds have been alternative means of debt financing in Nepal as a result total debt as a percentage of GDP widened from 1% in 1960 to 65.3% in 2000. According to Mr. Poudel, government debt consist Treasury Bills (TBS) National Saving Certificates (NSC) development bonds (DBs) special bonds (SBs) and Citizen Saving Certificates (CSCs). In his article he has suggested the following improving area in debt securities marketing in Nepal.

- ) Exchange of government securities at market price have to be encouraged.
- ) To make government securities active instruments of open market operation coupon rate on government securities has to be fixed closely to the market rate of interest.
- ) Products of government debt securities need to be diversified to meet investor demands.

) Like equity shares the marketable government securities need to be exchanged in the floor of Nepal stock exchange at competitive price.

According to Mr. Mahat, the analysis of operational efficiency to banks under the change scenario and deciding when to bank upon. This may also help the inefficient banks to upgrade their efficiency and be winner in the situation developing due to slow down in the economy. The regulators should also be concerned on the fact that the banks with unfavorable ratio may bring catastrophe in the banks industry.

An article published on 'The Kathmandu Post' daily of 28th April, 2004 entitles efficient banking by L. D. Mahat. In his article he has accomplished, the efficiency of banks can be measured using different parameters. The concept of productivity and profitability can be applied while evaluating efficiency of banks. The term productivity refers to the relationship between the quality of inputs employed and the quantity of output produced. An increase in productivity means that more output can be produced from the same inputs or the same output can be produced from fewer inputs. Interest expense to interest income ratio shows the efficiency of bank in high yielding asset. In other words, it reflect the efficiency in use of funds. Another article published on the Kathmandu post daily of 9th march, 2003 entitled managing a banking risk, by Chandra Thapa, in his article he has accomplished the subsequent issue.

Banking and financial service are among the fastest growing industries in developed world and are also emerging as cornerstones for other developing and underdeveloped nations as well bank's primary function is to take risk. Risk cannot be avoided by the bank but can only be managed. There are two types of risk. The first is the diversifiable risk or the firm's specific risk which can be migrated by maintaining an optimal and diversified portfolio. This is due to the fact that when one sector does not well the growth in another might to set the risk. Thus, depositor must have the knowledge of the sector in which their banks have make the lending. The second is undiversifiable risk and it is

correlated across borrower countries and industries. Such risk is not under control of the firm and banks.

According to Mr. Thapa risk management of the banks is not only crucial for optimal trade of between risk and profitability but is also one of the deciding factors for over all business investment lending to growth of economy. Managing risk not only needs sound professionalism at the organizational level but appropriate environment also needs to develop. Some of the major environmental problems of Nepalese banking sector are under government intervention, relatively weak regulatory fame, if we consider the international standard, meager corporate governance and the biggest of all is lack of professionalism. The only solution to mitigate the banking risk is to develop the badly needed commitment eradication of corrupt environment especially in the disbursement of lending and formulate prudent and conductive regulatory framework.

### **2.3 Review of Journal**

Some related journals to our study have been taken into account. A journal had published a Monte Carlo Method for optimal portfolio by Jerome B. Detemple, Rone Garcia and Marce Rindisbacher in February of 2003.

In this paper, they have developed a comprehensive approach for the calculation of optimal portfolios in assets calculation problems with complete markets. The major benefit of their method, which relies on Monte Carlo simulation, is its flexibility. Indeed, the approach permits

- (i) Any finite process for the state variables
- (ii) Any liffusion process for the state variables and
- (iii) Any number of risky assets. It is also valid for any preference relation in the von Neumann-Morgenstern class. This flexibility provides a distinct advantage over alternative approaches to the problem.

The paper has also derived a number of economic results that can be used as guidelines for sound assets allocation rules. Naturally, the performance

of these rules will also depend on empirical Sophistication of the underlying model of financial market. Clearly, they do not suggest that the model investigated here are adequate in that respect, although they appear more realistic than the specification and examined in the prior literature. But the important point here is that the approach that they have proposed offers great generally, it can be easily adopted to address the asset allocation problem for a large class of financial market models.

Another journal published in journals of finance entitled “local return factor and emerging stock market” by Mr. Rouwen Harst: 1999 is also relevant to our study. This article examines the source of return variation in emerging stock markets compared to developed market the correlation between the most emerging market and stock market has been historically low and until recently many emerging country restricted investment by foreign investors.

He attempts two set of questions to answer by his solution many emerging stock market have forms with multiple share classes are treated as single value weighted portfolio of the outstanding equity securities. He concludes that the return factors in emerging market are qualitatively similar to these developed markets. The low correlation between the country return factor suggest that the premium have a strong local character, furthermore, global exposure cannot explain the average factors return of emerging market. There is little evidence that correlation between the local factor portfolios have increased which suggests that factors responsible for increase of emerging market country relation are separated from those that drive the difference between expected return within these market. A Bayesian analysis of premiums in developed and emerging market shows that unless one has stranger prior beliefs to the country. The empirical evidence favours the hypothesis that the size. Momentum and value strategic compensated for expected returns around the world. At last the proper documents the relationship between expected return and share turnover examine the turnover characteristic of local return factor portfolio. There is no evidence of a relation between expected return and

turnover in emerging market. However, beta size and momentum and value are positively cross sectional correlated with turnover in emerging market. This suggests that the return premium do not simply reflect compensation for liquidity. (Several-Rowenhorst, K great 1999 “local return factor and turnover in emerging stock markets” Journal at finance, vo.16no-2, page -1439-40)

Similarly, another journal had published portfolio analysis with factors and scenarios on the September, 1981 by Haey M Markowitz and Andref period.

Mainly there are two findings in their study i.e.

- (i) How the scenario model can be extended to yield more meaningful estimates of covariance amongst security returns and
- (ii) How the well known computational advantages of the multifactor model-can also be realized for a scenario, or mixed scenario and factor model.

These developments should greatly enhance the practicability of the scenario approach for large scale portfolio analysis.

Goetzmann, William N has published his article in 1999, i.e. an introduction to investment theory. According to him, investors want to make more money in the future. The key measure of benefit derived from a security is the rate of return investor’s return is a measure of growth in wealth resulting from that investment. This growth measure is expressed in percentage forms to make it comparable across large and small investors. Stock returns may be riskier or more volatile but this concept is a difficult one to expression simply. To do so, he borrows a concept from statistics, called standard deviation. It is a single measure, allowing to quantify asset returns by risk, and it also provides the bases for investors discussions about portfolio choice.



## **2.4 Review of Previous Thesis**

### **Mr. Prakash Shrestha (2003)**

He has prepared the thesis on "Portfolio Analysis on Investment of Nepalese Commercial Banks". Risk and return on such assets, portfolio management and risk-return, relationship between various factors of commercial banks with various investment assets, performance of commercial banks towards investment. This study is also helpful to find out, to what extent commercial banks manage their risk and return using portfolio concept.

Objective:-

- To find out the relationship between various factors with various investment assets of commercial banks.
- To find out portfolio management and risk - return of commercial bank.
- How commercial banks manage their risk and return using portfolio concept.

Findings

- Most of commercial banks are interested to invest their funds in more liquid and less risky sectors.

Investment on loan and advances is better than that of investment on share, debentures and government securities because loan and advances provides fixed interest income.

Commercial bank most mobilizes their deposit and other funds to profitable sector.

### **Mr. Prakash Poudel (2004)**

He has prepared the thesis on entitled on "A Study of Portfolio Management on Common Stock of Commercial Banks." Portfolio management is one of the challenging tasks for every financial institution. This study is focused on the

portfolio analysis of listed four commercial banks (EBL, NBBL, BOKL, HIBL).

Objective

- ) To analyze the risk and return on common stock investment.
- ) To study the level on portfolio risk and return on investment of commercial banks.
- ) To find out the trend on investment in different assets.

Findings

Bank has made an investment in more than one assets by investor.

It has made an investment in only two assets, that is risky assets (share and debenture) and risk free asset (government security).

Among four banks EBL has invested its highest fund on risk free asset and lowest amount on risky assets. NBBL has invested the lowest amount risk free asset and highest amount on risky asset. None of the banks have invested any amount on NRB bond.

### **Kalpana Khaniya (2003)**

She has prepared the thesis on entitled 'Investment Portfolio Analysis of Joint Venture Banks'

Objective

- ) To portfolio structure of NABIL as compared to other joint venture banks.
- ) To analyze the investment on loan and advance.
- ) To compare the performance among under studied taken banks.

Findings

Investment portfolio structure on NABIL banks is almost similar to other Joint Venture banks.

Most of the investment is concentrate into loans and advances to private sector enterprises.

Securities investment is to purchase of government securities.

Financial performance of NABIL bank is at moderate position to other joint venture Bank.

### **Mr. Jagadish Basnet (2002)**

The main objective of this study was to survey the efficiency of portfolio management. He has entitled the thesis on "Portfolio management of joint venture banks in Nepal".

#### **Findings**

Those banks who manage the portfolio properly has achieved result.

Portfolio management of listed commercial banks has not been applied in Nepalese context.

Which concluded that the investment portfolio of joint venture bank's assets, basically allocation of fund into different component of banking assets have different degree of risk and varied rate of return should be verified in such a way that would balance the conflicting goals between maximum yield and minimum risk.

This study shows that From his thesis, portfolio management of joint venture banks in Nepal, the researcher found the gap that research of So, to fulfill this gap, this study has undertaken by the researcher.

### **2.5 Justification of the Study**

From the above study the researcher found the gap that all the previous research on portfolio management has been based on only showing the risk and return analysis of the stocks of JVBs. The researcher has been fully assumed that this research is one of the most demand and most valuable research under the financial sector of Nepal.

## **CHAPTER-III**

### **RESEARCH METHODOLOGY**

Research methodology describes the methods and process applied in the entire aspect of the study. It includes all the procedures from theoretical foundation to the collection and analysis of data. Research methodology is a systematically way to solve the research problem. It may be understood as a science of studying how research is done scientifically.

Research methodology is composed of both parts of technical aspect and logical aspect on the basis of historical data. Research is a systematic and organizational effort to investigate a specific problem that needs a solution. In this study, all the data are secondary and these data are analyzed using appropriate statistical and financial tools. Research methodology refers to the various sequential steps to adopt by a researcher in studying a problem with certain objectives in view.

This chapter will includes research design, nature of data, sample selection and size, data collection procedure, data processing and data analysis tools etc.

#### **3.1 Research Design**

Research design is based on two types of research design i.e. descriptive and analytical descriptive research design describes the general pattern of the Nepalese investors, business structure, problem of portfolio mgmt, etc. The analytical research design makes analysis of the gathered facts and information and makes a critical evaluation of it. Research design is a controlling media for the collection of data and it analysis of data in manner that aims to combine relevance to the research purpose with economy in procedure” (Source - Kothari, CR, Quantative Techniques” Vikash Publishing House Pvt. Ltd. 576 New Delhi-11001, 1992). Research design is the plan, structure and strategy of investigations conceived so as to obtain answer to research questions and to

control variances. To achieve this study descriptive and analytical research designs have been used.

### **3.2 Population and Sample**

The total number of listed commercial banks in NEPSE i.e. called population, how domestic and joint venture banks are listed in NEPSE. Among them only four banks are taken for the study, this study, which is called sample size. In the absence of reliable and valid data, the study has been selected only four banks which are NABIL Bank Ltd., Nepal SBI Bank Ltd., Standard Chartered Bank, Bank of Kathmandu Ltd. because these banks are categories at the same category. Their market prices of stock are also not so different between each other. Their establishment and operation data are also not so different.

### **3.3 Sources of Data**

This study mainly based on secondary data. (However, to certain extent, primary data are also used). Which are collected from their respective annual reports, especially from PL account, Balance sheet and concerned publications from different publishers. The secondary data are gathered from various sources such as books, journals, articles, reports etc. The necessary data and information at micro level have been collected from relevant institutions and authorities such as NRB, ministry of finance, SEBO and their respective publications. Similarly, the required micro level data derived from annual reports of selected banks and websites of banks and NEPSE. In addition to above supplementary data and information's were collected from different library such as T.U. central library, library of NRB, NEPSE, SEBO etc. similarly, various data and information's were collected from the periodical economic journals and from other published and unpublished reports. The major sources of data and information are as follows:-

- ) Annual reports of concerted commercial banks.
- ) Trading reports published by Nepal stock exchange.

- ) Materials published in papers and magazines
- ) Related websites.
- ) Economic survey, ministry of finance.
- ) NRB economic Report, NRB.
- ) Annual Reports of SEBO.
- ) Journal of finance.
- ) Other related books and booklets.

### **3.4 Data Collection and Processing Techniques**

This study mainly used secondary data, primary data will be used if necessary. The relevant data have been collected from the Nepal stock Exchange limited and concerned banks chosen as sample for this study. Most of the data were obtained after convincing extensively to the concerted officers or authorities official publicans like Economic survey. Annual reports, banking and non Banking financial statistics, Economic. Bulletin and related website etc. were obtained from respective offices. To obtained more information and reality about the various published data, investment policies at the banks, portfolio concept in the field of investment etc. Similarly, the required data have also been recollected from Degree campus library as central library of Kirtipur, Shanker Dev Campus Library, Kathmandu.

### **3.5 Data Analysis Tools**

Financial as well as the statistical tools will be used to make the analysis more convenience, reliable and authentic. Tools of analysis used in this study are as follows

### **3.6 Financial Tools**

These are several financial tools which can be applied in order to analyze the performance of JVBs. But the following main financial tools are used to analyze.

### 3.6.1 Ratio Analysis

It shows the relationship between two accounting figures. Ratio analysis is used to compare a firm's financial performance and status to that of other firms or to itself on time. It refers to the numerical or quantitative relationship between two variables. In financial analysis, ratio is used as an index of yardstick for evaluating the financial position and performance of the firms. Only such ratios which are related to investment of JVBs are taken here.

#### a) **Total Investment to Total Deposit Ratio**

This ratio measures that which bank is more successful in mobilizing their total deposit on investment. Higher the ratio, better the utilization of collected fund and it generates regular income to the banks. This ratio is calculated by dividing investment by the total deposit.

$$\text{Investment to total deposit ratio} = \frac{\text{investment}}{\text{Total deposit}}$$

#### b) **Loans and Advances to Total Deposit Ratio**

This ratio measures extend to which bank is able to mobilize their deposit funds to earn better profit by providing the fund to outsiders in the form of loans and advantages. The higher ratio represents the great efficiency of the firm in utilizing fund and vice -versa this ratio is calculated by dividing loans and advances by the total deposit. This can be stated as:

$$\text{Loans and Advances to Total Deposit Ratio} = \frac{\text{loans and advance}}{\text{Total deposit}}$$

#### c) **Investment on Shares and Debentures to Total outside Investment**

It shows the bank's investment in shares and debentures of subsidiary and other companies. It is calculated by dividing investment on shares and debentures by the total outside investment.

$$\frac{\text{Investment on share and debentures}}{\text{Total outside investment}}$$

#### d) **Return on Total Assets Ratio**

This ratio is calculated by dividing net profit after tax by total assets

$$\text{Return on total assets} = \frac{NPAT}{\text{Total assets}}$$

It measures the profitability with respect to total assets

### **3.6.2 Portfolio Analysis**

#### **Capm Model**

CAPM suggests that any investor can create a portfolio of assets that will eliminate virtually all diversifiable risk the only relevant risk is non diversifiable risk; therefore the investment decision and the pricing of capital assets should be based on undiversifiable risk. The CAPM further suggest that the price of capital asset should determine in a way that to compensate the systematic risk.

The required rate of return to bear certain level of systematic risk can be determined by using following equation:

$$\text{Required rate of return (K}_j\text{)} = R_f + (R_m - R_f) \cdot j$$

Where,

$R_f$  = Risk free rate of return

$R_m$  = expected return on market portfolio

$j$  = beta or systematic risk index of assets  $j$

#### **Analysis of Total Risk**

Total variability of returns of an asset or portfolio is measured by variance and standard deviation. This total risk can be divided into two parts i.e. diversifiable and undiversifiable risk.

$$\text{Total risk} = \text{Diversifiable risk} + \text{Undiversifiable risk}$$



## Diversifiable Risk

Diversifiable risk is also known as unsystematic risk. This type of risk is unique to an organization and can be largely eliminated by holding a diversified portfolio of investment. It is caused through the event like, labor strikes, management errors, invention, advertising campaign, and shifts in consumer test, availability of raw materials. It can be stated as:

Unsystematic risk = total risk - systematic risk

$$\text{Var}(e) = \sigma_j^2 - \beta_j^2 \sigma_m^2$$

Where,

var(e) = variance of standard error

## Undiversifiable Risk

Undiversifiable risk is known as the systematic risk. This risk is those portions of total variability in return caused by market factor (also called market risk) that simultaneously affect the price of all securities. This risk creates due to the changes in macro economic factor like, interest rate, inflation, investors' expectations; gross domestic product (GDP) etc. Undiversifiable risk is that part of total risk that can not be eliminated by allocating capital to a diversified portfolio of investment. It can be stated as:

$$\text{Systematic risk} = \beta_j^2 \sigma_m^2$$

Proportion or percentage of systematic risk is also measured by coefficient of determination. Coefficient of determination is the square of correlation coefficient.

$$\text{Percentage of systematic risk} = \frac{\text{Systematic risk}}{\text{Total risk}} \times 100$$

$$= \frac{\beta_j^2 \sigma_m^2}{\sigma_j^2} \times 100$$

$$\text{Coefficient of determination} = \frac{\text{Systematic risk}}{\text{Total risk}} \times 100$$

$$= \frac{\beta_j^2 \sigma_m^2}{\sigma_j^2}$$

## Return on Portfolio

The expected return of the portfolio is the weighted average of the expected returns of the individual assets in the portfolio. The weights are proportion of the investors wealth invested in each assets and sum of the weights must be equal one.

$$\text{Portfolio return } (R_p) = W_A R_A + W_B R_B + W_C R_C + \dots + W_A R_A.$$

Where,

$W_A$  = weight investment invested in stock 'A'

$W_B$  = weight of investment invested in stock 'B'

$R_A$  = expected return for stock 'A'

$R_B$  = expected return for stock 'B'

## Risk on Portfolio

The portfolio risk is measured by either variance or the standard deviation of returns. The portfolio risk affected by the variance of return as well as the covariance between the return of individual assets included in the portfolio and respective weights.

Hence, the portfolio risk can be defined as

$$\text{Variance } (\sigma_p^2) = \sqrt{W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \text{Cov}(r_A, r_B)}$$

Where,

$\sigma_p^2$  = Standard deviation of portfolio rate of return

$\text{Cov}(r_A, r_B)$  = Covariance of returns between asset A & B.

The covariance is related to correlation coefficient as shown in equation.

$$\text{Cov}(r_A, r_B) = P_{AB} \sigma_A \sigma_B$$

$P_{AB}$  = correlation coefficient between variable A & B.

Portfolio beta

The portfolio beta is the weighted average of the individual beta. The portfolio beta is calculated by using the following formula.

$$\text{Portfolio beta } (\beta_p) = \sum_{i=1}^n W_i \beta_j$$

Where,

$W_i$  = proportion of portfolio

$\beta_j$  = Beta coefficient of asset j

### Beta Coefficient

Beta is an index of systematic risk. Beta coefficient measures how much systematic risk a stock j has relative to market portfolio symbolically.

$$\beta_j = \frac{COV(r_j, r_m)}{\sigma_m^2}$$

Where,

$\beta_j$  = Beta coefficient stock j

$COV(r_j, r_m)$  = Covariance between stock J and market return M

Beta of market returns equals to 1. If beta is greater than 1, then the asset is more volatile than market and is called aggressive beta. If the beta is less than 1, the asset is called defensive beta and its price fluctuation is less volatile than market (Bhattacharai 2004:122).

### 3.6.3 Statistical Tools

#### a) Arithmetic Mean

Arithmetic mean of a set of observations is the sum of all the observations divided by the number of observations. Which is as follows.

$$\text{Arithmetic mean } (\bar{X}) = \frac{\sum x}{n}$$

Where,

$x$  = Sum of total values

$n$  = no. of observations

### b) Standard Deviation of Stock Return

Standard deviation (S.D.) is defined as the positive square root of the mean of the square of the deviations taken from the arithmetic mean (Bajracharaya, 2004: 177). It is the square root of the variance and measures the unsystematic risk on the stock investment. It is denoted by  $\sigma_j$  Symbolically.

$$\sigma_j = \sqrt{\frac{\sum R_j^2 - \frac{(\sum R_j)^2}{N}}{N}}$$

Where,

$\sigma_j$  = standard deviation of return of stock  $j$  during period  $n$ .

Covariance:

### c) Covariance

Covariance is the joint variance of any two assets. It measures how two random variable, such as the return on securities A & B move together. It can state as follows:

$$COV(r_j, r_m) = \frac{(\sum R_j \bar{R}_j)(\sum R_M \bar{R}_M) - \frac{(\sum R_j)(\sum R_M)}{N}}{N}$$

Where,

$COV(r_j, r_m)$  = Covariance between stock  $J$  and market return  $M$

Coefficient of variation:

The coefficient of variation is the way of expressing risk and it is quite appropriate to use it. It measures risk per unit of expected return. It is calculated as follows:

$$CV_j = \frac{\sigma_j}{\bar{R}_j}$$

Where,  $\sigma_j$  = S.D. of security j

$\bar{R}_j$  = expected (average) return on security j.

### **3.7 Statement of the Common Hypotheses about the Study**

Hypothesis is the statement about the relationship between two or more variables which need to be investigated for its truth. Hence, some general hypotheses that related to this study are as follows.

- The higher level of deposit, the higher level of investment.
- The return on portfolio depends upon the amount of fund invested in each individual assets.
- Portfolio return on investment is higher than the individual return on investment
- Risk can be reduced by investing wealth in more than one security.
- Portfolio risk is less than individual risk on investment i.e. portfolio management minimize the investment risk and maximize return.

## CHAPTER-IV

### DATA PRESENTATION AND ANALYSIS

This chapter is the major part of the whole study. This chapter makes and analysis and interpretation of all collected relevant data related to the study. In this chapter, necessary table, figures have also presented to achieve the objective of the study. Several financial and statistical tools have been used in this chapter. In this chapter the investment portfolios of banks are analyzed with the help of the following tools.

1. Ratio Analysis
2. Trend Analysis
3. Risk and Return on Investment Portfolio
4. Correlation and Regression Analysis
5. Investment Portfolio Performance

#### 4.2 Ratio Analysis

The purpose of this chapter is to evaluate and analyze the financial position and performance of different joint venture bank. In this part only those major ratios, which are related with investment operations of joint venture banks are calculated and analyzed.

##### a) Investment to total Deposit Ratio

This ratio measures that which banks are more successful in mobilizing their total deposit an investment Higher the ratio is better in utilization of collected fund and it generated regular calculated by dividing investment by the total deposit. This can be state as:

$$\text{Investment on total deposit ratio} = \frac{\text{total investment}}{\text{total deposit}}$$

The following table number (4.1) shows the ratio of investments to total deposit of NABIL, BOKL, SBI, SCBL.

**Table : 4.1**

**Investment to Total Deposit Ratio (%)**

Fiscal year	NABIL	BOKL	SBI	SCBL
96/97	22.83	1.75	16.82	27.86
97/98	10.92	11.10	18.20	30.28
98/99	15.01	6.36	4.63	30.03
99/00	9.79	4.67	4.45	12.09
00/2001	48.64	3.61	5.65	24.01
2001/2002	52.88	7.33	0.75	26.66
2002/2003	44.85	11.66	18.51	61.95
2003/2004	41.33	29.43	26.50	58.88
2004/2005	45.55	32.00	30.81	55.22
2005/2006	52.36	35.30	33.86	53.68
Mean	34.42	14.32	16.01	38.06
S.D.	17.69	12.15	18.58	17.50
C.V.	51.39	84.8	116.02	45.98

Source: Annual report of NABIL, BOKL, SBI, SCBL

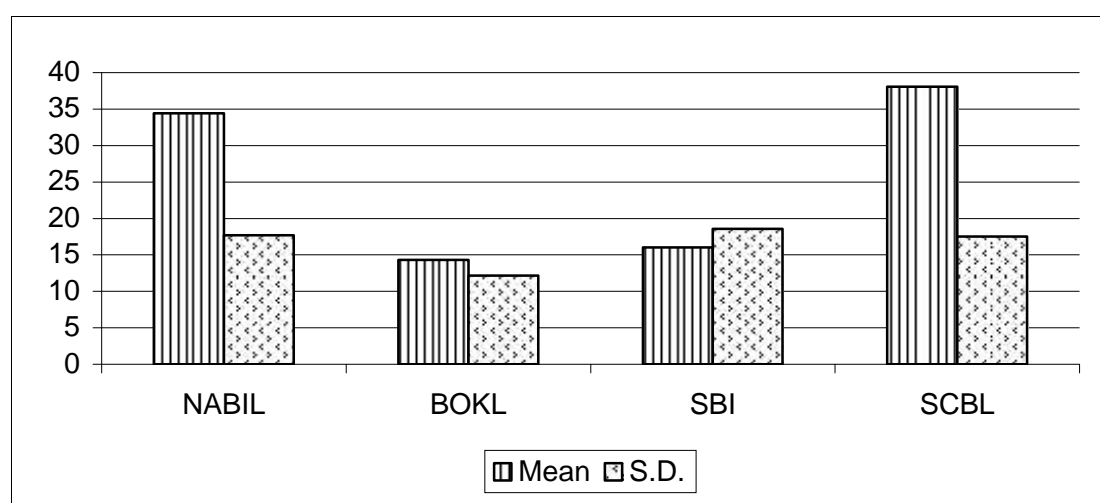
Joint venture Bank's average means 25.70

Joint venture Bank's average means S.D. 16.48

Joint venture Bank's average mean C.V. = 74.55

**Figure: 4.1**

**Investment to Total Deposit Ratio (%)**



Mean and Standard Deviation of Investment to Total Deposit Ratio of banks.

The comparative table no. 1 reveals that the ratio are in fluctuable. The mean investment to deposit ratio of SCBL is highest i.e. 38.06% and BOKL has the lowest ratio i.e. 14.32% among the four joint venture banks. The other banks NABIL, SBI have 34.42% and 16.01% respectively. On the basis of average ratio, it can be said that SCBL and NABIL are capable to mobilize the deposit on the investment than other banks because they have the greater investment to total deposit ratio than the average mean i.e. 25.70% so that the performance of both banks are quiet nice. Similarly, the C.V. of SCBL is the lowest i.e. 45.98% and SBI has the highest ratio i.e. 116.02% among the four joint venture banks. The other banks NABIL and BOKL have the C.V. ratio of 51.39% and 84.8% . The SCBL has the lesser of C.V. of four joint venture banks. Nabil are moderate consistent. SBI is the least consistent. BOKL has also less consistent ratio. So it is clear that SCBL is most successful.

**b) Loan and Advance to Total Deposit Ratio**

The loan and advance is also one of the major sectors of investment. This ratio measure extend to which bank are successful to mobilize their deposit funds to earn profit by providing the fund to outsides in the form of loan and advances. This ratio is calculated by dividing loans and advances by total deposit. This can be stated as follows:

$$\text{Loans and advances to total deposit Ratio} = \frac{\text{Loans and advances}}{\text{Total deposit}}$$



**Table : 4.2**

**Loan and advance to total deposit ratio (%)**

Fiscal year	NABIL	BOKL	SBI	SCBL
96/97	54.25	68.67	70.91	42.80
97/98	55.98	64.58	61.82	47.22
98/99	57.02	70.43	66.33	35.56
99/00	54.01	70.04	77.21	37.07
00/2001	50.45	73.56	62.03	36.69
2001/2002	46.02	75.56	76.07	33.14
2002/2003	55.43	72.83	67.82	29.72
2003/2004	56.33	68.94	70.27	29.88
2004/2005	55.61	69.88	70.36	43.40
2005/2006	59.68	70.42	69.32	46.28
Mean	54.48	77.29	72.22	38.18
S.D.	3.79	7.92	7.21	6.43
C.V.	6.96	10.02	9.98	16.84

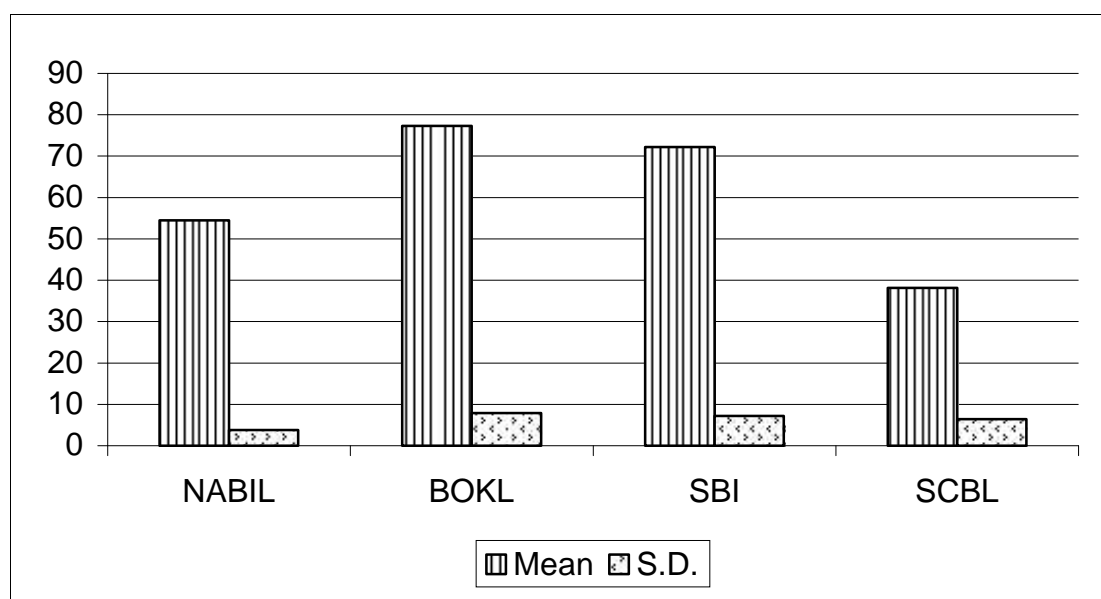
Source: Annual report of NABIL, BOKL, SBI, SCBL

Average means = 60.54%

Average means C.V. = 10.95

**Figure :4.2**

**Loan and advance to total deposit ratio (%)**



Mean and Standard Deviation of Loans and advances to total deposit Ratio of banks.

In the above table, the mean loans and advances to total deposit ratio of BOKL is highest i.e. 77.29% and SCBL has lowest i.e. 38.18% among four joint venture banks. Other banks NABIL and SBI are 54.48% and 72.22% respectively. On the basis of average ratio. It can be said that SBI and BOKL are the banks that mobilize their total deposit more effective on loan and advances among four joint venture banks. SCBL are poor in mobilizing total deposit loan and advances and Nabil bank comes under normal categories and C.V. of Nabil is lowest and SCBL is highest ratio i.e. 6.96% and 16.84% and other banks BOKL and SBI have the C.V. of 10.02% and 9.98%. The among four bank Nabil bank is most successful bank. BOKL and SBI have moderate consistent. SCBL is least consistent.

**c) Return on Total Assets Ratio**

This ratio measures the effectiveness of the banks in using its overall resources. It measures in terms of relationship between net profit and total assets. This ratio is calculated by dividing net profit after tax by total assets. This can be calculated as follows:

$$\text{Return on total assets} = \frac{\text{Net profit after Tax}}{\text{Total assets}}$$

**Table: 4.3**

**Return on Total Assets %**

Fiscal year	NABIL	BOKL	SBI	SCBL
1996/97	1.85	-0.27	1.70	2.50
97/98	1.59	-0.97	1.43	2.89
98/99	2.30	1.54	0.35	2.76
99/00	2.19	1.54	0.98	2.33
00/2001	1.59	1.02	0.17	2.23
2001/2002	1.34	0.15	0.58	2.60
2002/2003	2.51	1.10	0.64	2.41
2003/2004	2.72	1.34	0.72	2.27
2004/2005	2.1	1.20	0.83	2.57
2005/2006	2.35	1.94	0.87	2.43
Mean	2.09	.85	0.83	2.52
S.D.	0.55	52	57	0.26
C.V.	26.32	61.17	68.57	10.28

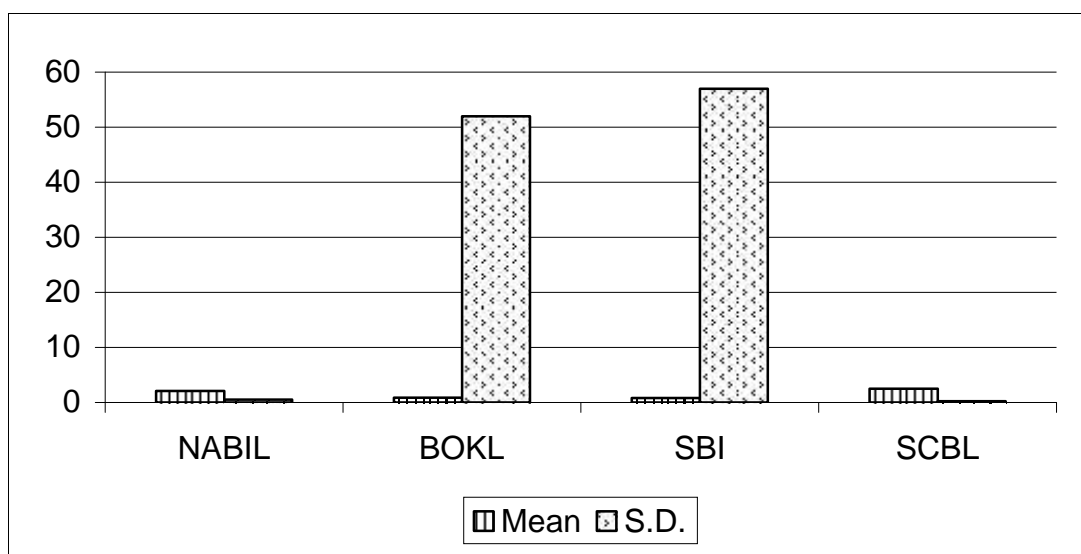
Source: Annual report of NABIL, BOKL, SBI, SCBL

Average means = 1.55%

Average means C.V. = 41.59

**Finger: 4.3**

**Return on Total Assets %**



Mean and Standard Deviation of Return on Total Assets Ratio of banks

The above table shows, the mean return, S.D. and C.V. on total assets ratio of SCBL is highest return i.e. 2.52% and SBI has the lowest i.e. 0.83% through out the review period. Nabil and BOKL have 2.09% and 0.85% ratios NABIL and BOKL have the moderate mean return on total assets ratios. SCBL and Nabil have above the average return so that actual performance of both banks have good but BOKL and SBI Ltd. have the below the average return which indicate the actual performance of both banks are below the standard SBI is less consistent on four joint venture banks.

**d) Investment of Share and Debenture to Total outside Investment**

The ratio between investment on share and debenture and total outside investment reflects the extent on which the banks are successful to mobilize their total outside investment on purchase of share and debenture of other companies to generate income. This ratio is calculated by dividing total outside investment.

Investment of share and debenture to total outside investment

$$= \frac{\text{Investment on share and debenture}}{\text{Total outside investment (TOI)}}$$

Where, TOI = Loan and advances + Bills purchased and discounted + investment

**Table :4.4**  
**Investment on Share and Debenture to total Outside Investment Ratio**

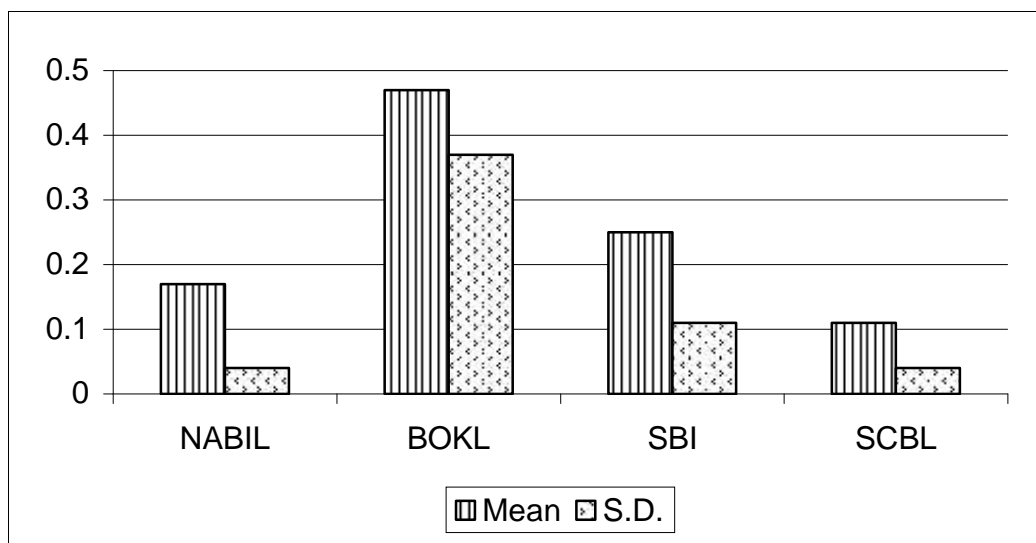
Fiscal year	NABIL	BOKL	SBI	SCBL
1996/97	0.15	0.21	0.14	-
97/98	0.16	1.39	0.0	0.11
98/99	0.23	0.41	0.27	0.17
99/00	0.19	0.25	0.24	0.14
00/2001	0.12	0.53	0.20	0.07
2001/2002	0.14	0.33	0.37	0.08
2002/2003	0.16	0.60	0.31	0.07
2003/2004	0.16	0.28	0.25	0.06
2004/2005	0.16	0.28	0.19	0.11
2005/2006	.24	0.33	0.47	0.15
Mean	0.17	0.47	0.25	0.11
S.D.	0.04	0.37	0.11	0.04
C.V.	23.53	78.72	44.00	36.36

Source: Annual report of NABIL, BOKL, SBI, SCBL

Average means = 11.88

Average means C.V. = 945.56

**Figure: 4.4**  
**Investment on Share and Debenture to total Outside Investment Ratio**



Mean and Standard Deviation of Investment of share and debenture to total outside investment ratio of banks.

The above table number 4.4 shows that the BOKL has the highest mean ratio i.e. 0.47% and SCBL is the lowest investor i.e. 0.11% of total outside investment in share and debentures among the four joint venture banks and Nabil has lowest C.V. i.e. 23.53% which shows that the variability of ratio between investment on share and debenture and total outside investment is most uniform among the four banks.

Similarly, the highest C.V. of BOKL i.e. 78.72% shows that it has more variability in investment on shares and debentures to total outside investment.

## **4.2 Trend Analysis**

Trend analysis is a statistical tool which highlights the previous trend and forecast for a future with the help of past and present information. The purpose of trend analysis in this chapter is to analyze the trend of loans and investment and total deposits. Loans and investment include loans, advances, overdrafts, cash credit local and foreign bills purchases and discounts. Investment includes government securities, NRB bond share and debentures. Likewise, total deposits consist of current deposits, fixed deposits, saving deposits, money at call other deposits.

Here, least square method is used to determine the trend value which is state as:

$$y = a + bx$$

y = Dependent variable

x = Independent variable (time)

a = y intercept

b = Slope of the trend line

To make calculation easier, the deviation of the independent variable (i.e. time) are taken from the middle of a and b can be easily calculated by using following formula.

$$a = \frac{y}{n}$$

$$b = \frac{xy}{x^2}$$

**Table: 4.5**  
**Position of Total Loans and Investment and Total**  
**Deposits of NABIL Bank**

(in million)

Fiscal year	Total loans and investment	Total deposit	Ratios
1997	3608.35	5354.15	67.39
1998	5378.73	7089.47	75.86
1999	5975.72	7752.23	77.08
2000	5845.94	8737.77	66.90
2001	6817.18	9464.28	72.03
2002	7153.13	12779.51	55.97
2003	15697.59	15839.01	99.10
2004	15335.05	15506.43	98.89
2005	13485.44	13447.66	100
2006	13789.71	14119.03	97.69
Mean			810.91
S.D.			81.91
C.V.			

See in appendix 3 (A).

**Table: 4.6**  
**Position of Total Loan and Investment to Total Deposits of BOKL**  
(in million)

Fiscal year	Loan and investment	deposit	Ratios
1997	171.55	329.98	51.98
1998	994.92	1281.75	77.62
1999	1367.65	1714.37	79.77
2000	1258.29	1773.87	70.93
2001	1926.27	2564.83	75.10
2002	3090.84	4196.41	73.65
2003	4630.7	5724.13	80.89
2004	4992.23	5723.29	87.22
2005	6310.6	6170.71	102.26
2006	7814.38	7741.65	100.93
Mean			80.04

See in appendix 3 (B).

**Table: 4.7**  
**Position of Total Loan and Investment to**  
**Total Deposits of SBI**  
(in million)

Fiscal year	Loan and investment	deposit	Ratios
1997	606.69	714.84	84.87
1998	1517.38	1624.60	93.40
1999	2069.54	2358.91	87.73
2000	2996.58	3744.51	80.25
2001	3107.81	4380.02	70.95
2002	3704.05	4535.73	81.66
2003	4114.40	6612.29	62.22
2004	4837.85	5572.47	86.81
2005	5631.38	6522.82	86.34
2006	6966.02	7198.33	96.77
Mean			83.10

See in appendix 3 (C).



**Table: 4.8**  
**Position of total loan and advance and investment to total deposits**  
**of SCBL**

(in million)

Fiscal year	Loan and investment	deposit	Ratios
1997	3933.09	5519.44	71.25
1998	4629.78	6047.77	76.55
1999	5551.76	7623.16	72.82
2000	5059.48	8530.03	59.31
2001	6651.73	11165.17	59.57
2002	8008.04	12568.49	63.71
2003	15219.98	15430.05	98.63
2004	14524.24	15835.75	91.71
2005	15790.26	18755.63	84.18
2006	17683.18	21161.44	83.56
Mean			761.29
			76.13

See in appendix 3 (D).

### Trend Value

**Table: 4.9**  
**Trand value ( $y_c = a + bx$ ) of loan and investment to total**  
**deposits ratio of NABIL**

(in million)

Fiscal year	Loan and investment	Total deposit	Ratio %
2007	16810.9	17103.2	98
2008	18174.94	18217.28	99.76
2009	19538.98	19331.3	101
2010	20903.02	20445.4	102
2011	22267.06	21559.40	103
2012	23631.1	22673.44	104
2013	24995.14	23787.48	105

See in appendix 2

**Table : 4.10****Trand value ( $y_c = a + bx$ ) of Loan and Investment to Total Deposits Ratio of BOKL**

(in million)

Fiscal year	Loan and investment	Total deposit	Ratio %
	$y_c = 3255.74 + 820.61x$	$y_c = 3722.1 + 814.87x$	
2007	7769.09	8203.8	94.70
2008	8589.70	9018.75	95.24
2009	9410.31	9833.62	95.69
2010	10230.9	10648.49	96.07
2011	11051.53	11463.36	96.40
2012	11872.15	12278.23	96.69
2013	12692.75	13093.10	96.94

**See in appendix 2****Table: 4.11****Trand value ( $y_c = a + bx$ ) of Loan and Investment to Total Deposits Ratio of SBI**

(in million)

Fiscal year	Loan and investment	Total deposit	Ratio %
	$y_c = 3555.17 + 652.35x$	$y_c = 4326.45 + 711.90x$	
2007	7143.09	8241.9	86.67
2008	7795.44	8953.8	87.06
2009	8447.79	9665.7	87.39
2010	9100.14	10377.6	87.69
2011	9752.49	11089.5	87.94
2012	10404.84	11801.4	88.16
2013	11057.19	12513.3	88.36

**See in appendix 2**

**Table : 4.12**

**Trand value ( $y_c = a + bx$ ) of loan and investment to total deposits ratio of SCBL (in million)**

Fiscal year	Loan and investment	Total deposit	Ratio %
	$y_c = 9705.15 + 1688.32x$	$y_c = 11563.7 + 1775.15x$	
2007	18990.91	21326.325	89.04
2008	20679.23	23101.475	89.51
2009	22367.55	24876.625	89.91
2010	24055.87	26651.775	90.25
2011	25774.19	28426.93	90.66
2012	27432.51	30202.075	90.83
2013	29120.83	31977.225	91.067

**See in appendix 2**

The above table represents that, Nabil bank limited loan and investment have been increasing by Rs 1364.04 million every year. It is expected to each Rs 24995.14 million at the end of 2013 similarly, Nabil Bank Ltd. total deposit have been increasing by Rs. 1114.04 million every year and expected to reach Rs. 23878.48 at the end of 2013 other things remaining the same, the ratio of loans and investment to total deposit of Nabil Bank Ltd. in 2013 will be 105% which is the highest ratio among the four joint venture banks.

Similarly, the above table shows that, BOKL limited loan and investment have been increasing by Rs. 920.61 million per year and expected to reach 12692.75 million at the end of year 2013. Similarly the BK limited total deposit have been increasing by 814.87 million per year expected to reach Rs. 13093.10 million on the end of year 2013. The ratio of loan and investment to total deposit of BOKL at the end of year 2013 will be 96.94%.

Similarly, SBI Bank limited loan and investment have been increasing by Rs. 652.35 million every year. It is expected to reach Rs. 11057.19 million

at the end of 2013. Similarly, SBI bank limited total deposits have been increasing by Rs. 711.898 million every year and expected to reach Rs. 12513.3 million at the end of 2013 other thing remaining the same, the ratio of loan and investment to total deposits of SBI bank limited in 2013 will be 88.37% which is the lowest ratio among four joint ventral banks. Likewise, SCBL limited loan and investment have been increasing by Rs. 1688.32 million every year. It is expected to reach Rs. 29120.83 million at the end of 2013. Similarly, total deposit of SCBL limited have been increasing by Rs. 1775.15 million every year and expected to reach Rs. 31977.225 at the end of 2013. Other thing reaming the same, the ratio of loan and investment to total deposits of SCB Ltd. in 2013 will be 91.067%.

#### **4.3 Investment Portfolio Analysis**

Investment portfolio is one of the tools that help for proper utilization of resources. Banks have to investment its funds in different productive sector of the investment alternatives to earn profit. Higher risk can g et higher returns. To minimize the risk, banks have to invest different types of assets not only the same risk plays a vital role while analyzing the investment alternatives. The measurement of risk has always been a subject for debate in the investment operation. Risk can be measured in many ways using various statistical techniques such as range, some-inter-quartile, range mean, absolute deviation, variance semi-variance etc.

#### **Risk and Return Analysis**

The purpose of this chapter is to analyze and compare the risk and return of the asset or security of the four joint venture banks. To analyze the risk, return, the beta coefficient, expected rate of return and security market line are used.

##### **Expected rate of return**

The rate of return on a security that an investor anticipates receiving over a holding period.

$$E (R_J) = R_F + (R_M - R_F) B_J$$

$E (R_J)$  = expected return on asset j

$R_F$  = risk free return

$B_J$  = coefficient of Beta

$R_M$  = average market return

Estimated of market parameter market return and market standard deviation is the most important factors to analyze the risk return. For that, purpose we take 13 companies from overall market selected companies have been taken from different sectors, such as banking sector, manufacturing sector trading sector, service sector, hotel sector etc. return is the combination of capital gain yield and dividend yield capital gain yield can be calculated by difference between this year price and last year price with respect to the last year dividend yield can be calculated dividend per share divided by market price per share. Market return is the mean return of the selected companies, which is represented by the market return of the study. Standard deviation measured the risk that is most necessary to study the risk and expected rate of return and to analyze the beta coefficient of the study. Market standard deviation is representing the all risk of the stock. It helps the inventor to take the decision for the investment.

**Table : 4.13**

**Calculation of expected return on market and variance of market.**

Year	Closing price	R <sub>M</sub> (%)	(R <sub>M</sub> - $\overline{R_M}$ )	(R <sub>M</sub> - $\overline{R_M}$ ) <sup>2</sup>
1996/097	195-48	-	-	-
1997/098	185.61	-5.05	9.25	85.56
1998/099	176.31	-5.01	-9.21	84.82
1999/00	163.35	-7.35	-11.25	126.56
2000/01	216.92	32.79	28.59	817.39
2001/02	360.72	66.29	62.09	3855.17
2002/03	348.43	-3.41	-7.61	57.91
2003/04	227.54	-34.70	-38.9	1513.21
2004/05	204.86	-9.97	-14.17	200.79
2005/06	222.04	8.93	4.19	17.56
		R <sub>M</sub> =41.98		(R <sub>M</sub> - $\overline{R_M}$ ) <sup>2</sup>

$$\dots \text{Expected return } (\overline{R_M}) = \frac{R_M}{N} \times \frac{41.98}{10} = 4.20\%$$

$$\text{Standard deviation } (\dagger_M) = \sqrt{\frac{(R_M - \overline{R_M})^2}{N}} \times \sqrt{\frac{76758.97}{10}} = 27.40\%$$

$$\text{Variance } (\dagger_M^2) = 751\%$$

$$\text{C.V} = \frac{\dagger_M}{R_M} \times \frac{0.2740}{4.20} \times 100 = 6.52\%$$

Source : [www.nepalstock.com](http://www.nepalstock.com)

**Table: 4.14****Calculation of expected Return and Variance of NABIL**

Year	Closing	Cash	$R_N$ (%)	$(R_N - \overline{R_N})$	$(R_N - \overline{R_N})^2$
1996/097	881	35	-	-	-
1997/098	980	0	2.16	-11.84	140.18
1998/099	500	0	-44.44	-58.44	3415.23
1999/00	430	30	-800	-22.00	484
2000/01	700	30	69.77	55.77	3110.29
2001/02	1400	55	107.86	93.86	8809.70
2002/03	1500	40	10.00	-4	16
2003/04	735	30	-49.00	-63.00	3969
2004/05	735	50	9.80	-7.2	51.84
2005/06	1000	60	44.90	30.90	954.81
			$R_N=140.05$		$(R_N - \overline{R_N})^2$

$$\dots \text{Expected return } (\overline{R_N}) = \frac{R_N}{N} \times \frac{140.05}{10} = 14.00\%$$

$$\text{Standard deviation } (\dagger_N) = \sqrt{\frac{(R_M - \overline{R_M})^2}{N \sum 1}} \times \sqrt{\frac{20951.05}{10 \sum 1}} = 48.25\%$$

$$\text{Variance } (\dagger_N^2) = 2327.89\%$$

$$\text{C.V} = \frac{\dagger_N}{R_N} \times \frac{0.4825}{0.14} = 3.44\%$$

Source : [www.nepalstock.com](http://www.nepalstock.com)

Table no 4.16 shows that the expected rate of return of NABIL is 14.00% which is sum of single rate of return divided by no. of observation. Where standard deviation of NABIL is 48.25% which is due to the variation in single period rate of return. Where co-efficient of variation of NABIL Bank is 3.44.

**Table : 4.15**

**Calculation of co-variance and beta co-efficient of NABIL**

Fy	$(R_N - \bar{R}_N)$	$(R_M - \bar{R}_M)$	$(R_N - \bar{R}_N) (R_M - \bar{R}_M)$
1996/097	-	-	-
1997/098	-11.84	9.25	-109.52
1998/099	-58.44	-9.21	538.23
1999/00	-22.00	-11.25	247.50
2000/01	55.77	28.59	1594.46
2001/02	93.86	62.09	5827.77
2002/03	-4	-7.61	30.44
2003/04	-63.00	-38.9	2450.7
2004/05	-7.2	-14.17	102.02
2005/06	30.90	4.19	129.47
			10811

$$\text{Covariance of NABIL } (\text{cov } r_n r_m) = \frac{(R_N - \bar{R}_N) (R_M - \bar{R}_M)}{N Z1}$$

$$= \frac{10811}{10 Z1} = 1201.22$$

$$\text{Beta coefficient} = \frac{\text{cov } r_N r_M}{\dagger_m} = \frac{1201.22}{751} = 1.60$$

$$\text{Correlation coefficient } (P_{Nm}) = \frac{\text{cov } r_N r_M}{\dagger_N \dagger_M} = \frac{1201.22}{1322.05} = 0.91$$

From the above table calculation of beta coefficient of NABIL is 1.60 which is greater than 1. Beta is greater than 1 show that the stock of NABIL is more volatile than the market or stock seems to be an aggressive.



**Table: 4.16****Calculation Expected Return and Variance of BOKL.**

Year	Closing	Cash	R <sub>B</sub> (%)	(R <sub>B</sub> - $\bar{R}_B$ )	(R <sub>B</sub> - $\bar{R}_B$ ) <sup>2</sup>
1996/097	-	0	-	-	-
1997/098	-	0	-	-	-
1998/099	-	0	-	-	-
1999/00	153	0	-	-	-
2000/01	285	7.49	91.17	47.71	2276.24
2001/02	998	32.49	261.66	218.22	47619.97
2002/03	850	0	-14.83	-58.29	3397.72
2003/04	254	10	-68.94	-112.40	12633.76
2004/05	195	5	-21.26	-64.72	4188.68
2005/06	295	10	56.41	12.95	167.70
			R <sub>B</sub> =304.21		(R <sub>B</sub> - $\bar{R}_B$ ) <sup>2</sup>

$$\dots \text{Expected return } (\bar{R}_B) = \frac{R_B}{N} \times \frac{304.21}{7} = 43.46\%$$

$$\text{Standard deviation } (\dagger_B) = \sqrt{\frac{(R_B - \bar{R}_B)^2}{N}} \times \sqrt{\frac{70284.07}{7}} = 108.23\%$$

$$\text{Variance } (\dagger_B^2) = 12713.73\%$$

$$\text{C.V} = \frac{\dagger_B}{R_B} \times \frac{1.0823}{30.4346} \times 2.49\%$$

Source : [www.nepalstock.com](http://www.nepalstock.com)

The table No. 4.18 shows that the expected rate of return of bank of Kathmandu Ltd. is 43.46 which is sum of single rate of return divided by no. of observation. Where standard deviation of BOKL is 108.23 which is due to the

variation is single period rate of return. Where coefficient of variation of BOKL is 2.49.

**Table: 4.17**

**Calculation of co-variance and Beta coefficient of BOKL**

Fy	$(R_B - \bar{R}_B)$	$(R_M - \bar{R}_M)$	$(R_B - \bar{R}_B) (R_M - \bar{R}_M)$
1996/097	-	-	-
1997/098	-	9.25	-
1998/099	-	-9.21	-
1999/00	-	-11.25	-
2000/01	47.71	28.59	1364.03
2001/02	218.22	62.09	13549.28
2002/03	-58.29	-7.61	443.59
2003/04	-112.40	-38.9	4372.36
2004/05	-64.72	-14.17	917.08
2005/06	12.95	4.19	54.26
			20700.60

$$\text{Covariance of BOKL } (\text{cov } r_B r_M) = \frac{(R_B - \bar{R}_B) (R_M - \bar{R}_M)}{N Z1}$$

$$= \frac{20700.60}{10 Z1} = 2300$$

$$\text{Beta coefficient} = \frac{\text{cov } r_B r_M}{\dagger_m} = \frac{2300}{751} = 3.06$$

$$\text{Correlation coefficient } (P_{Bm}) = \frac{\text{cov } r_N r_M}{\dagger_N \dagger_M} = \frac{2300}{5222} = 0.44$$

The table 4.19 shows the covariance of BOKL with the market is positive but less than perfectly correlated. BOKL has beta of 3.06 which indicated that it is an aggressive type of assets. It is more risky type of assets.

**Table : 4.18**

**Calculation of Expected Return and Variance of SBI.**

Year	Closing	Cash	R <sub>SBI</sub> (%)	(R <sub>SBI</sub> -	(R <sub>SBI</sub> - $\overline{R_{SBI}}$ ) <sup>2</sup>
1996/097	512	0	-	-	-
1997/098	412	20	-15.63	-23.86	569.30
1998/099	412	20	4.85	-3.38	11.42
1999/00	440	20	11.65	3.42	11.69
2000/01	562	10	30.00	21.77	473.93
2001/02	1165	15	109.96	101.73	10948.99
2002/03	1500	0	28.76	20.53	421.48
2003/04	401	0	-73.27	-81.5	6642.25
2004/05	255	8	-34.41	-42.64	1818.17
2005/06	307	0	20.39	12.16	147.87
			R <sub>SBI</sub> =82.30		(R <sub>SBI</sub> - $\overline{R_{SBI}}$ ) <sup>2</sup> =20445.10

$$\dots \text{Expected return } (\overline{R_{SBI}}) = \frac{R_{SBI}}{N} \times \frac{82.30}{10} = 8.23\%$$

$$\text{Standard deviation } (\dagger_{SBI}) = \sqrt{\frac{(R_{SBI} - \overline{R_{SBI}})^2}{N}} \times \sqrt{\frac{20445.10}{10}} = 47.66\%$$

$$\text{Variance } (\dagger_{SBI}^2) = 2271.68\%$$

$$\text{C.V} = \frac{\dagger_{SBI}}{R_{SBI}} \times \frac{0.4766}{0.0823} = 5.79\%$$

Source : [www.nepalstock.com](http://www.nepalstock.com)

Table No 4.20 shows that the expected rate of return of SBI is 8.23 where standard deviation of SBI is 47.66 which is due to the variation is single period rate of return. Where coefficient of variation of SBI is 5.79.

**Table : 4.19**

**Calculation of co-variance and Beta coefficient of SBI**

Fy	$(R_S - \bar{R}_S)$	$(R_M - \bar{R}_M)$	$(R_S - \bar{R}_S) (R_M - \bar{R}_M)$
1996/097	-	-	-
1997/098	23.86	9.25	220
1998/099	-3.38	-9.21	31.12
1999/00	3.42	-11.25	-38.47
2000/01	21.77	28.59	622.40
2001/02	101.73	62.09	6316.42
2002/03	20.53	-7.61	-156.23
2003/04	-81.5	-38.9	3170.35
2004/05	-42.64	-14.17	604.21
2005/06	12.16	4.19	56.95
			10821.5

$$\text{Covariance of SBI } (\text{cov } r_S r_m) = \frac{(R_S - \bar{R}_S) (R_M - \bar{R}_M)}{N Z1}$$

$$= \frac{10821.5}{10 Z1} = 1202$$

$$\text{Beta coefficient} = \frac{\text{cov } r_S r_M}{\uparrow_m} = \frac{1202}{751} = 1.60$$

$$\text{Correlation coefficient } (P_{0053M}) = \frac{\text{cov } r_S r_M}{\uparrow_S \uparrow_M} = \frac{1202}{1305.88} = 0.92$$

The table no 4.21 shows that the covariance of SBI with the market is passive but less than perfectly correlated. SBI has beta of 1.60 which indicates that it is an aggressive type of assets. In other words assets of SBI is more volatile than the market.

**Table : 4.20**

**Calculation of Expected Return and Variance of SCBL**

Year	Closing price	Cash div.	$R_s$ (%)	$(R_s - \bar{R}_s)$	$(R_s - \bar{R}_s)^2$
1996/097	1000	30	-	-	-
1997/098	720	100	-18	-34.52	1191.63
1998/099	970	90	47.22	30.70	942.49
1999/00	840	70	-6.18	22.70	515.29
2000/01	1162	70	46.67	30.15	909.02
2001/02	1985	100	79.43	62.91	3957.67
2002/03	2144	100	13.05	-3.47	12.64
2003/04	1550	100	-23.04	-39.56	1564.99
2004/05	1640	110	12.90	-3.62	13.16
2005/06	1745	110	13.11	-3.41	11.63
			$R_s=165.16$		$(R_s - \bar{R}_s)^2 = 7926.24$

$$\dots \text{Expected return } (\bar{R}_s) = \frac{R_s}{N} \times \frac{165.16}{10} = 16.52\%$$

$$\text{Standard deviation } (\dagger_s) = \sqrt{\frac{(R_s - \bar{R}_s)^2}{N}} \times \sqrt{\frac{7296.24}{10}} = 29.68\%$$

$$\text{Variance } (\dagger_s^2) = 880.69\%$$

$$\text{C.V} = \frac{\dagger_s}{R_s} \times \frac{0.2968}{0.1652} = 1.97\%$$

Source : [www.nepalstock.com](http://www.nepalstock.com)

Table no 4.22 shows that the expect rate of return of SCBL is 16.52. where standard deviation of SCBL is 29.68 which is due to the variation is single period rate of return. Where CV of SCBL is 1.97.

**Table: 4.21**

**Calculation of co-variance and Beta coefficient of SCBL**

Fy	$(R_{SCB} - \overline{R_{SCB}})$	$(R_M - \overline{R_M})$	$(R_{SCB} - \overline{R_{SCB}}) (R_M - \overline{R_M})$
1996/097	-	-	-
1997/098	-34.52	9.25	319.31
1998/099	30.70	-9.21	-279.37
1999/00	22.70	-11.25	-255.38
2000/01	30.15	28.59	861.99
2001/02	62.91	62.09	3906.08
2002/03	-3.47	-7.61	26.41
2003/04	-39.56	-38.9	1538.88
2004/05	-3.62	-14.17	51.30
2005/06	-3.41	4.19	-14.29
			6154.93

$$\text{Covariance of SBI } (COV r_{SCB} r_m) = \frac{(R_{SCB} - \overline{R_{SCB}}) (R_M - \overline{R_M})}{N Z1}$$

$$= \frac{6154.93}{10 Z1} = 683.88$$

$$\text{Beta coefficient} = \frac{COV r_{SCB} r_m}{\uparrow_m} = \frac{683.88}{751} = 0.90$$

$$\text{Correlation coefficient } (P_{SCBM}) = \frac{COV r_{SCB} r_m}{\uparrow_{SCB} \uparrow_M} = \frac{683.88}{813.23} = 0.84$$

We know that beta is that index of systematic risk, which is arouse by market forces and con not be diversified. SCBL has the beta of 0.90 which

indicates that it is a defensive type of assets which seem to less volatile than market. CV is 683.88 indicates the lower than perfectly positively correlation of SCBL with market, and therefore it is a less risky assets.

### Summary of Above Calculation

(In %)

Particular	NABIL	BOKL	SBI	SCBL
Return	14	43.46	8.23	16.52
S.D	48.25	108.93	47.63	29.68
C.V	3.44	2.49	5.71	1.97

#### 4.4 Security Market Line

The capital asset pricing model (SML) is an equilibrium theory of how to price and measure risk. The logic of the security market line equation is that the required return on any investment is the risk free return plus a risk adjusted factor is obtained by multiplying the risk premium required for the market rate of return by the riskiness of the individual investment.

$$E(r_i) = R_f + E(r_m) - R_f) S_i$$

Thus the required rate of return for joint venture bank could be calculated by SML equation where risk free rate of return is taken as weighted average return of the bill rate published by NRB.

Where, risk free rate of return  $R_f = 2.90$

Beta coefficient of different banks ( $S_i$ )

Market rate of return  $E(r_m)$  = beta coefficient and comparison of  $E(r_i)$  and required rate of return is shown in the below table.

**Table: 4.22**

**Comparative Analysis of ERR and RRR of different Joint Venture Banks**

Banks	RF	E (r <sub>m</sub> )	S <sub>i</sub>	RRR= R <sub>f</sub> + E(r <sub>m</sub> ) - R <sub>f</sub> S <sub>i</sub>	ERR	Remarks
NABIL	2.9	4.20	1.60	4.98	14.00	Under
BOKL	2.9	4.20	3.06	6.87	43.46	Under
SBI	2.9	4.20	1.60	4.98	8.23	Under
SCBL	2.9	4.20	0.90	4.07	16.52	Under

**Partitioning of total risk into systematic and unsystematic risk**

Total risk measured by the variance of return. Total risk can be partitioned into systematic risk and unsystematic risk and unsystematic risk.

Total risk measured by the variance of return. Total risk can be partitioned into systematic risk and unsystematic risk. Systematic risk cannot be eliminated through diversification. Beta coefficient is the index of systematic risk.

Beta coefficient of different bank is summarized below.

Banks	Beta
Nabil	1.60
BOKL	3.06
SBI	1.60
SCBL	0.90

Above table shows that the beta of BOKL bank is greater than four joint venture bank and beta of NABIL, BOKL and SBI are greater than 1,  $B > 1$ . It three banks has aggressive type of assets.

Which indicate the more volatile than market. If market goes up by 10% these assets will increase by 16.6% and 16.0% respectively in other hand SCBL is less than one beta i.e.  $B < 1$  which indicates the defensive type of assets.

Calculation of systematic and unsystematic risk:



## **NABIL**

Total risk = systematic risk + unsystematic risk

$$\text{Var}(r_n) = (s_n)^2 \mid \text{var}(r_m) + \text{var}(e)$$

$$2327 = (1.63)^2 \mid 751 + \text{var}(e)$$

$$\text{or, } 2327 - 1995.33 = \text{var}(e)$$

$$\text{var}(e) = 331.66$$

Unsystematic risk = 331.66

## **BOKL**

$$\text{Var}(r_B) = (s_B)^2 \mid \text{var}(r_m) + \text{var}(e)$$

$$\text{or, } 11713.73 = (3.06)^2 \mid 751 + \text{var}(e)$$

$$\text{or, } 11713.73 = 7032.06 + \text{var}(e)$$

$$\text{or, var}(e) = 4691.0$$

## **SBI**

$$\text{var}(SBI) = (s_s)^2 \mid \text{var}(r_m) + \text{var}(e)$$

$$\text{or, } 2271.68 = (1.60)^2 \mid 751 + \text{var}(e)$$

$$\text{or, } 2271.68 - 1922.56 = \text{var}(e)$$

$$\text{var}(e) = 349.12$$

## **SCBL**

$$\text{Var}(SCBL) = (s_{SCBL})^2 \mid \text{var}(r_m) + \text{var}(e)$$

$$\text{Or, } 880.69 = (0.90)^2 \mid 751 + \text{var}(e)$$

$$\text{Or, } 880.69 - 608.31 = \text{var}(e)$$

$$\text{var}(e) = 272.38$$

**Table :4.23**

**Total Risk and its Partition into System and Unsystematic 'Risk'**

Bank	Total risk	Sys. risk	Unsys. Risk	Co-efficient
Nabil	2327	1995.33	331.66	0.92
BOKL	11713.73	7032.06	4691.0	0.44
SBI	2271.68	1922.56	349.12	0.92
SCBL	880.69	608.31	272.38	0.84

The above table indicates that total risk at BOKL is highest that is 11713.73 and total risk of SCBL is lowest i.e. 880.69. Among the four joint venture banks, systematic risk is the marker risk and that can't eliminate through diversification. Here NABIL and SBI has highest coefficient of determinant, which indicates that the total risk of them has, consist-with systematic risk that can't be eliminated. Unsystematic risk up NABIL and SBI can be diversified away in the other hand BOKL has highest total risk and lower coefficient of determination which shows the there is huge part of unsystematic risk and total risk.

**4.5 Risk and Return on Portfolio**

Investment portfolio is one of the tools that help for proper utilization of resources. Banks have to investment its fund in different productive sector of the investment alternatives to earn profit higher risk can get higher return. To minimize the risk, banks have to invest different types of assess not only the same risk plays a vital role while analyzing the investment alternatives. Risk and return portfolio calculation as follows:

**Table: 4.24**

**Calculation of Weight Invested in Government Securities (Risk Free Assets) and Weight Invested in (Risky Assets) Share and Debenture of NABIL**

Year	Amount invested share and debenture	Amount invested government securities	Total investment
1996/097	9.10	19.99	29.09
1997/098	9.10	38.33	47.43
1998/099	9.73	37.96	47.69
1999/00	9.73	27.13	36.86
2000/01	16.51	31.39	47.9
2001/02	16.12	25.13	41.45
2002/03	18.82	32.39	51.21
2003/04	22.22	36.87	59.09
2004/05	22.22	27.04	49.26
2005/06	22.22	20.56	42.17
Total	155.77	296.82	452.57
Mean	15.58	29.68	
Weight	34.5	65.5	100%

$$\begin{aligned}\text{Portfolio return } (R_p) &= W_m R_m + W_R R_f \\ &= 0.345 \times 4.20 + 0.655 \times 2.90 \\ &= 3.34\end{aligned}$$

$$\begin{aligned}\text{Portfolio risk } (\sigma_p) &= W_m \sigma_m \\ &= 0.345 \times 27.40 \\ &= 9.45\end{aligned}$$

**Table: 4.25**

**Calculation of Weight Invested in Government Securities (Risk Free Assets) and Weight Invested in (Risky Assets) Share and Debenture of BOKL**

Year	Amount invested share and debenture	Amount invested government securities	Total investment
1996/097	-	-	-
1997/098	10.49	0.52	11.01
1998/099	10.26	4.04	14.3
1999/00	40.70	3.82	44.52
2000/01	14.34	2.50	16.84
2001/02	14.35	2.92	17.27
2002/03	32.61	3.52	36.13
2003/04	36.82	4.86	41.68
2004/05	36.82	11.38	48.2
2005/06	25.91	13.28	39.19
Total	247	52	299
Mean	24.7	5.2	
Weight	82.5	7.5	100%

$$\begin{aligned}\text{Portfolio return } (R_p) &= W_m R_m + W_R R_f \\ &= .825 \times 4.20 + 0.075 \times 2.9 \\ &= 3.96\end{aligned}$$

$$\begin{aligned}\text{Portfolio risk } (\sigma_p) &= W_m \sigma_m \\ &= 0.825 \times 27.40 \\ &= 22.60\end{aligned}$$

**Table: 4.26**

**Calculation of Weight Invested in Government Securities (Risk Free Assets) and Weight Invested in (Risky Assets) Share and Debenture of SBI**

Year	Amount invested share and debenture	Amount invested government securities	Total investment
1996/097	12.45	1.46	13.91
1997/098	10.49	10.01	20.5
1998/099	10.26	8.50	18.76
1999/00	6.78	27.35	34.12
2000/01	14.94	4.34	19.33
2001/02	15.57	3.93	19.5
2002/03	11.66	4.27	5.93
2003/04	17.33	4.50	21.83
2004/05	17.33	8.96	26.29
2005/06	20.32	10.48	30.8
Total	137.2	83.8	221
Mean	13.72	8.38	
Weight	62	38	100%

$$\begin{aligned}\text{Portfolio return (R}_p\text{)} &= W_m R_m + W_R R_f \\ &= 0.62 \times 4.20 + 0.38 \times 2.9 \\ &= 3.70\end{aligned}$$

$$\begin{aligned}\text{Portfolio risk (}\sigma_p\text{)} &= W_m \sigma_m \\ &= 0.62 \times 27.40 \\ &= 16.98\end{aligned}$$

**Table: 4.27**

**Calculation of Weight Invested in Government Securities (Risk Free Assets) and Weight Invested in (Risky Assets) Share and Debenture of SCBL**

Year	Amount invested share and debenture	Amount invested government securities	Total investment
1996/097	24.90	76.06	100.96
1997/098	20.98	49.18	70.68
1998/099	20.53	47.09	67.62
1999/00	13.56	41.31	54.87
2000/01	19.59	59.75	79.34
2001/02	19.59	68.01	87.6
2002/03	14.61	56.31	70.92
2003/04	10.85	51.76	62.61
2004/05	10.85	49.59	60.44
2005/06	12.72	44.49	46.21
Total	168.2	543.6	711.8
Mean	16.82	54.36	
Weight	23.5	76.5	100%

$$\begin{aligned}\text{Portfolio return } (R_p) &= W_m R_m + W_R R_f \\ &= 0.235 \times 4.20 + 0.765 \times 2.9 \\ &= 3.205\end{aligned}$$

$$\begin{aligned}\text{Portfolio risk } (\sigma_p) &= W_m \sigma_m \\ &= 0.235 \times 27.40 \\ &= 6.43\end{aligned}$$

The above calculation shows portfolio of return and risk of joint venture banks. Risk free rate of return for all bank is 2.9% and return on market is 4.20%. BOKL has the highest portfolio return i.e. 3.96 and SCBL has lowest portfolio return. Because BOKL is investing 34.5% of its total investment and remaining 65.5% at its investment on risk free assets, also it has the highest total risk on portfolio i.e. 22.60% of total investment higher the return will be

higher the risk. SCBL as invested only 23.5% of its total investment in risky assets and reaming 76.5% of its total investment in risk free assets, so it has the lowest portfolio return and its has also the lowest portfolio risk i.e. 6.43% among four JVBs.

So form the above it can be concluded that higher the investment in risk free assets (government securities) lower will be the risk and lower the return also but if higher the investment in risky assets (share and debenture) higher will be the risk and higher will be the return.

#### **4.6 Correlation and Regression Analysis**

Regression and correlation analyses are the techniques of studying how the variations in one series are related to variations in another series measurement of the degree of relationship between two or more variable is called correlation analysis and using the relationship between two or more variable to estimate the unknown on is termed as regression analysis regression analysis shows how the variables are related.

The multiple regression equation is the algebraic relationship between one dependent variable and two or more independent variable. This relationship is used to estimate the value of dependent variable for the given values of independent variables. We can estimate the unknown value of one variable from the given or known values of the other variables. Multiple regression analysis is a logical extension of the simple linear regression analysis. In multiple regression analysis, instead of a single independent variable, two or more independent variables are used to estimate the unknown value of the dependent variables.

The multiple regression equation describe the average relationship between one dependent variable and two or more independent variable and this relationship is very much useful for estimating the dependent variable. Thus, a multiple regression equation of  $x_1$  on  $x_2$  and  $x_3$  is an equation for estimating a dependent variable  $x_1$  from two independent variable  $x_2$  and  $x_3$ .

Let  $X_1$ ,  $X_2$  and  $X_3$  denoted return on assets, investment to total deposit and liquidity assets respectively. Since, return on assets dependent variable, investment to total deposit and liquidity (current assets/ current liability) assets independent variable.

$a$ = point of intercept on y-axis= the value of  $x_1$  when  $x_2= x_3 = 0$

$b_1$  slope of  $x_1$  with variable  $x_2$ = holding variable  $x_3$  constant= corresponding change in  $x_1$  for each unit.

$b_2$ = slope of  $x_1$  with variable  $x_3$  holding variable  $x_2$  constant= corresponding change.

Correlation and regression analysis can be calculated as follows:

**Table: 4.28**

**Calculation of correlation and regression equation of  $X_1$  on  $X_2$  and  $X_3$  of NABIL**

Years	$X_1$	$X_2$	$X_3$	$X_1 X_2$	$X_2 X_3$	$X_1 X_3$	$X_1^2$	$X_2^2$	$X_3^2$
1996/097	9.85	22.83	64.2	224.87	1465.68	632.37	97.02	521.21	4121.64
1997/098	11.59	10.92	29.7	126.56	324.32	344.22	134.34	119.24	882.09
1998/099	17.30	15.01	23.4	259.67	351.23	404.82	299.29	225.30	547.56
1999/00	12.19	9.79	18	119.34	176.22	219.42	148.59	95.84	324
2000/01	15.59	48.64	18.48	758.29	898.86	288.10	243.04	2365.85	341.51
2001/02	21.54	52.88	14.5	1139.3	766.76	312.33	463.97	2796.3	210.25
2002/03	12.51	44.85	9.85	561.07	441.77	123.22	156.50	2011.52	97.022
2003/04	9.72	41.33	12.44	401.72	514.145	120.91	94.47	1708.16	154.75
2004/05	22.31	45.55	16.86	1016.2	312.47	376.146	497.73	2074.08	284.25
2005/06	22.35	52.36	16.62	1170.24	870.22	371.45	499.52	2741.56	276.22
	$X_1=$ 154.95	$X_2=$ 344.16	$X_3=$ 224.05	$X_1 X_2=$ 5776.99	$X_2 X_3=$ 6121.98	$X_1 X_3=$ 3192.96	$X_1^2=$ 2634.04	$X_2^2=$ 14659.78	$X_3^2=$ 7239.29

$$r_{12} = \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_2^2 - (\sum x_2)^2}}$$

$$= 0.548$$



$$r_{13} = X \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= (0.453)$$

$$r_{23} = X \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - (\sum x_2)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= (0.746)$$

$$R_{1.23} = X \frac{\sqrt{r_{12}^2 \Gamma r_{13}^2 Z 2r_1^2 | r_{13} | r_{23}}}{1 Z r_{23}^2}$$

$$= 0.551$$

We get the equation as follows.

$$X_1 = 9.60 + 0.169 X_2 + 0.0211 X_3$$

**Table: 4.29**

**Calculation of correlation and regression equation of  
X<sub>1</sub>, on X<sub>2</sub> and X<sub>3</sub> of BOKL**

Years	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>1</sub> X <sub>2</sub>	X <sub>2</sub> X <sub>3</sub>	X <sub>1</sub> X <sub>3</sub>	X <sub>1</sub> <sup>2</sup>	X <sub>2</sub> <sup>2</sup>	X <sub>3</sub> <sup>2</sup>
1996/097	11.27	30.27	10.11	341.14	306.029	113.93	127.01	916.27	102.21
1997/098	10.97	25.97	11.10	284.89	288.26	121.76	120.34	674.44	123.1
1998/099	21.54	10.51	6.36	226.38	66.84	136.99	463.97	110.46	40.44
1999/00	18.02	16.65	4.67	300.03	77.75	84.15	324.72	277.22	21.80
2000/01	16.15	23.63	3.61	381.62	85.30	50.30	260.82	558.37	13.24
2001/02	12.92	9.11	7.33	117.70	66.77	94.70	166.92	82.99	53.72
2002/03	22.33	19.31	11.66	431.19	225.15	260.36	498.62	372.87	135.95
2003/04	20.54	7.84	29.43	161.033	230.75	604.49	421.89	61.46	866.12
2004/05	12.36	16.24	32.0	200.76	519.68	395.52	152.76	236.73	1024
2005/06	23.19	18.35	35.31	425.53	647.93	818.83	537.77	336.72	1246.79
	X <sub>1</sub> = 169.47	X <sub>2</sub> = 177.95	X <sub>3</sub> = 151.58	X <sub>1</sub> X <sub>2</sub> = 2870.27	X <sub>2</sub> X <sub>3</sub> = 2514.44	X <sub>1</sub> X <sub>3</sub> = 2680.98	X <sub>1</sub> <sup>2</sup> = 3074.82	X <sub>2</sub> <sup>2</sup> = 3654.53	X <sub>3</sub> <sup>2</sup> = 3627.48

$$r_{12} = X \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_2^2 - (\sum x_2)^2}}$$

$$= -0.462$$

$$r_{13} = X \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= 0.216$$

$$r_{23} = X \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - (\sum x_2)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= (0.228)$$

$$R_{1.23} = X \frac{\sqrt{r_{12}^2 \Gamma r_{13}^2 - 2r_{12} r_{13} r_{23}}}{1 - r_{23}^2}$$

$$= 0.475$$

Equation we get,

$$X_1 = 26.53 - 0.289X_2 + 0.0459X_3$$

**Table: 4.30**

**Calculation of correlation and regression equation of  
X<sub>1</sub>, on X<sub>2</sub> and X<sub>3</sub> of SBI**

Years	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>1</sub> X <sub>2</sub>	X <sub>2</sub> X <sub>3</sub>	X <sub>1</sub> X <sub>3</sub>	X <sub>1</sub> <sup>2</sup>	X <sub>2</sub> <sup>2</sup>	X <sub>3</sub> <sup>2</sup>
1996/097	18.70	16.82	28.24	314.53	474.99	528.08	349.69	282.91	797.49
1997/098	13.43	18.20	30.21	244.42	549.82	405.72	180.36	331.2	912.64
1998/099	41.35	14.63	25.8	604.95	377.45	1066.83	1709.82	214.63	665.64
1999/00	8.40	14.45	10.47	121.38	151.29	87.99	70.56	208.8	109.62
2000/01	9.35	15.65	16.65	146.32	260.57	155.67	87.42	244.92	277.22
2001/02	11.92	11.75	23.63	140.06	277.65	281.66	142.68	138.06	558.37
2002/03	11.93	18.51	19.11	220.82	353.72	227.98	142.32	342.62	365.19
2003/04	19.87	26.50	16.22	526.53	429.83	322.29	394.81	702.25	263.08
2004/05	20.13	30.81	18.31	620.20	564.13	368.58	405.2	949.25	335.258
2005/06	20.30	33.30	22.24	675.99	740.59	451.47	412.09	1108.89	494.61
	X <sub>1</sub> = 175.38	X <sub>2</sub> = 200.62	X <sub>3</sub> = 210.88	X <sub>1</sub> X <sub>2</sub> = 3615.2	X <sub>2</sub> X <sub>3</sub> = 4180.04	X <sub>1</sub> X <sub>3</sub> = 3896.2	X <sub>1</sub> <sup>2</sup> = 3894.35	X <sub>2</sub> <sup>2</sup> = 4523.47	X <sub>3</sub> <sup>3</sup> = 4061.11

$$r_{12} = X \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_2^2 - (\sum x_2)^2}}$$

$$= 0.152$$

$$r_{13} = X \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= 0.351$$

$$r_{23} = X \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - (\sum x_2)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= 0.115$$

$$R_{1.23} = X \frac{\sqrt{r_{12}^2 \Gamma r_{13}^2 Z 2r_1^2 | r_{13} | r_{23}}}{1 Z r_{23}^2}$$

$$= 0.368$$

Equation we get,

$$X_1 = 25.92 + 0.141X_2 - 0.531X_3$$

**Table: 4. 31**

**Calculation of correlation and regression equation of  
X<sub>1</sub> on X<sub>2</sub> and X<sub>3</sub> of SCBL**

Years	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>1</sub> X <sub>2</sub>	X <sub>2</sub> X <sub>3</sub>	X <sub>1</sub> X <sub>3</sub>	X <sub>1</sub> <sup>2</sup>	X <sub>2</sub> <sup>2</sup>	X <sub>3</sub> <sup>2</sup>
1996/097	21.31	27.86	26.5	593.69	738.29	564.71	454.11	776.17	702.25
1997/098	23.33	30.28	36.16	706.43	104.9	843.61	544.2	916.87	1307.5
1998/099	34.85	30.03	39.29	1046.54	1179.04	1369.25	1214.52	901.80	1543.70
1999/00	31.56	12.09	42.3	381.56	511.40	1334.9	996.03	146.16	1789.2
2000/01	32.91	24.01	43.5	790.16	1044.43	1431.58	1083.06	576.48	1892.25
2001/02	29.90	26.66	36.26	497.13	966.69	1084.17	894.01	710.75	1314.78
2002/03	28.31	61.95	46.9	1753.80	2905.45	1327.7	801.4	3837.8	2199.6
2003/04	31.32	58.88	38.22	1844.12	2250.39	1197.5	980.94	3466.85	1460.7
2004/05	26.51	55.22	44.51	1463.88	2457.84	1179.96	702.78	3049.24	1981.2
2005/06	36.33	53.68	38.52	1950.19	2067.75	1399.43	1319.86	2881.54	1483.7
Total	X <sub>1</sub> = 296.33	X <sub>2</sub> = 380.31	X <sub>3</sub> = 392.42	X <sub>1</sub> X <sub>2</sub> = 11327.5	X <sub>2</sub> X <sub>3</sub> = 15215.28	X <sub>1</sub> X <sub>3</sub> = 11732.81	X <sub>1</sub> <sup>2</sup> = 8990.91	X <sub>2</sub> <sup>2</sup> = 15429.89	X <sub>3</sub> <sup>2</sup> = 15674.92

$$r_{12} = X \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - Z f x_1} \sqrt{N \sum x_2^2 - Z f x_2}}$$

$$= 0.128$$

$$r_{13} = X \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - Z f x_1} \sqrt{N \sum x_3^2 - Z f x_3}}$$

$$= 0.433$$

$$r_{23} = X \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - Z f x_2} \sqrt{N \sum x_3^2 - Z f x_3}}$$

$$= 0.564$$

$$R_{1.23} = X \frac{\sqrt{r_{12}^2 \Gamma r_{13}^2 Z 2r_1^2 | r_{13} | r_{23}}}{1 Z r_{23}^2}$$

$$= 0.692$$

Equation we get,

$$X_1 = 8.708 + 0.449X_2 + 0.0972X_3$$

Above calculation show that, correlation coefficient of SCBL bank is perfectly correlated and SBI bank has positive but low significant among four JVBs. All banks are positively correlated among four JVBs, has perfectly positive correlated and regression line expressed in terms of mathematical relationship between dependent and independent variable.

There are positive correlation between profit, investment on liquidity assess. It means the test of significance of the value of r shows that there is good significant relationship between profit, investment and liquidity assets.

Regression line cash can be fitted to show the relationship between two or more variables. Investment and liquid assets can be forecasted by the profit for this purpose, profit, investment and liquidity assess are interrelated variables.

Regression of SCBL and NABIL has positively related but BOKL has negatively related with investment and SBI'S profit has also negatively related with liquidity assets.

The relationship between profit and investment of SBI, SCBL, NABIL has positively related, BOKL has negatively related but profit and liquidity assets of NABIL and SCBL, BOKL, positively but very low significant SBI has negatively related.

#### **4.7 Portfolio Performance Evaluation**

The portfolio of assets usually offer advantage of reducing risk through diversification. The portfolio risk depends upon weight of funds invested in various assets, risk of individual assets.

To test the portfolio performance this study uses sharp's portfolios performance model. According to this model, in assessing the performance of a portfolio, it is necessary to consider both risk and return. William f. Sharpe devised an index of portfolio performance denoted by  $s_p$ , measure the slope of the line starting at risk- less rate  $R$  and running out to assess is defied as below.

### Sharp Portfolio Performance Evaluation

$$S_p = \frac{\bar{r}_p - Z r_f}{\dagger_p}$$

Where,

$\bar{r}_p$  = Expected return on portfolio

$r_f$  = Risk free rate of return

$\dagger_p$  = Standard deviation of portfolio

**Table: 4.32**

### Performance of Various Banks

Banks	$r_f$	$r_p$	$\dagger_p$	$s_p$	Ranking
NABIL	2.9	3.34	9.45	0.04656	4
BOKL	2.9	3.96	22.60	0.049	1
SBI	2.9	3.70	16.98	0.047	2
SCBL	2.9	3.20	6.43	0.04665	3

Note: for the calculation of Sharpe's performance measure the risk free rate of interest (return) is taken according to Nepal Rastra Bank economic report 2005 (p.4) which is 2.9.

Form the above table shows that  $s_p$  of stock of BOKL is the highest i.e. 0.049 and  $s_p$  of stock of NABIL is worst i.e. 0.04656, SBI is second position i.e. 0.047 and SCBL is in third position i.e. 0.04665 among four JVBs.

### 4.8 Major Finding of the Study

Investment to total deposits ratio of SCBL is fluctuating trend throughout the review period. The mean investment to total deposit ratio of SCBL is highest i.e. 38.06% the C.V. ratio of SCBL is lowest among four

JVBs, i.e. 45.981 lower ratio indicates the most consistent which is better than high consistent.

**a) Findings from ratio analysis**

From the ratio analysis of various joint venture banks on the basis of their investemtn strategies, the following major findings are summarized.

**Finding from Ratio Analysis**

SN	Ratios		NABIL	BOKL	SBI	SCBL
	Investment to total deposit ratio	Mean	34.42	14.32	16.03	38.06
		CV	51.39	84.8	116.02	45.98
	Loan and advance to total deposit ratio	Mean	54.48	77.29	72.23	38.18
		CV	6.96	10.02	9.98	16.84
	Return on total assets ratio	Mean	2.09	0.85	0.83	2.52
		CV	26.32	1.17	68.57	10.28
	Investment on share and debenture to TOI	Mean	0.17	0.47	0.25	0.11
		CV	23.53	78.72	44.00	36.36

The total loan and advance to total deposit ratio of SBI, BOKL are the quite better than NABIL and SCBL. It means SBI and BOKL are more successful to use it deposit on loan and advance and NABIL has the moderate condition. But the loan and advance to deposit ratio of SCBL is very poor. It is not able to make healthy ratio.

The return on total assets ratio of the SCBL is highest and NABIL are moderate position but the BOKL and SBI are the weakest position and BOKL and SBI are also a poor bank in this ratio among the other banks during the study period.

The investment of share and debenture to total outside investment ratio of the BOKL is highest and SCBL is the smallest investment of share and debenture of other companies. NABIL has the highest portion and SBI has lowest portion of investment.

### b) Findings form Trend Analysis

The slope of the trend i.e. increasing or decreasing trend on various banks are tabulated as follows:

<b>Banks</b>	<b>Total Deposit</b>	<b>Total Investment</b>
NABIL	1364.04	1114.04
BOKL	820.61	814.8
SBI	652.35	711.90
SCBL	1688.32	1775.15

It shows that the total investment and total deposit of joint venture bank's are in increasing trend.

### c) Finding from Risk and Return

Joint venture banks should be analyzed the risk and return while making investment decision. So the risk and return are tabulated below.

<b>Particulars</b>	<b>NABIL</b>	<b>BOKL</b>	<b>SBI</b>	<b>SCBL</b>
Average Return	14%	43.46	8.23	16.52%
S.D.	48.25	108.23	47.66	29.68%
C.V.	3.44	2.49	5.79	1.97%

NABIL bank has the highest expected rate of return and SBI has the lowest return. So investor can get the highest rate of return in NABIL bank, but only expected rate of return can not gives appropriate comparison between the assets

### d) Finding from Portfolio Performance Test

By using the Sharpe's portfolio performance measure, the following findings are tabulated.

<b>Particulars</b>	<b>NABIL</b>	<b>BOKL</b>	<b>SBI</b>	<b>SCBL</b>
Sharp's perform (S <sub>P</sub> )	0.046556	0.049	0.047	0.04665

BOKL has the best performance, as it has highest risk premium at per unit risk and NABIL has the worst performance as it has the lowest risk premium at per unit at total risk.

## **CHAPTER-V**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATION**

This chapter highlights some selection, actionable conclusions and recommendations on the basis of major findings, which are derived from the analysis of NABIL.

In order to carry out this study; data have been basically obtained by the secondary sources. This chapter summarizes the whole study. Summary gives the brief introduction to all the chapters of the present situation under the topic of the study. Conclusions of the findings are based on the consequences of the analysis of relevant data by using various financial and statistical tools. The recommendations are presented in terms of suggestions, which are prepared on the basis of findings and conclusions.

#### **5.1 Summary**

The investment decision is one of the major functions of financial management. It depends upon two factors i.e. risk and return. Risk is the fluctuation of actual return and expected return. Higher risk may have greater possible return. Investor attitude, perception and risk handling capacity also play an essential role in rational investment decision. The risk is involved in every step of return every investor wants a maximum return from minimum level of risk so as to minimize the risk investor should diversify their investment by the means of portfolio. The basic objective of portfolio management is to minimize risk of the given rate of return.

Portfolio management is one of the challenging tasks for every financial institution. Nowadays there is very high competition in banking industry but very less opportunities to make an investment without proper

management of portfolio, any institution can not compete effectively in market. Portfolio management of banks assets basically means allocation of fund to different components of banking assets having different degrees of risks and varying rates of returns in such way that it can balance the conflicting goal of



maximum yield in minimum risk. Bank has to invest its resources in different productive sector of investment alternative to earn profit. Uncertainty of profit creates risk to an investor, so every investor has to diversify their investment in different sector to minimize risk. Diversification of asset on different sectors lowers the risk of portfolio. The main objective of the study is to identify the situation of portfolio management of JVBs, analyze the risk and return on common stock investment level of portfolio risk and return of JVBs investment.

JVBs are major financial institutions which occupy quite an important place in the framework of every economy. They provide capital for the different sector such as industry trade and so on. So, the economic development of the every country is highly affected by the development of the JVBs for the growth and expansion of the JVBs they should not be dependent on same kind of investment, they should have to follow the diversification strategy of portfolio management. Nepal being listed among least developed countries, the JVBs, successful formulation and effective implementation of investment policy is the prime requisite JVBs must mobilize its deposits and other funds to profitable secured, stable and marketable sector. This study is mainly focused on how the JVBs have managed their available fund.

In Nepalese context, it seems that joint venture banks are exercising to follow the diversification strategy, they are investing in different kinds of securities such as government securities (treasury bill treasury bonds, development bonds etc) foreign government securities share and debentures of other companies, loan and advances etc. Although they are investing on various assets but they are not seem to be capable to invest their funds on more profitable sector where there is low risk most of the banks are interested on invest their funds on liquid and less risky sector. This due to lack of sound investment policy the portfolio management. The study is focused on the portfolio analysis of joint venture banks. While making an analysis and interpreting the data on portfolio, various financial tools like ratio analysis,

holding period return, CAPM models, portfolio performance measures etc. and statistical tools like mean, S.D., coefficient of variation, covariance correlation, coefficient of determination, trend analysis etc. have been used information are tabulated and presented as per the requirement of study. The data which are used in this study are mainly of secondary nature from this study it is found that those investors who had made diversification on their investment in different sector have got a better result rather than investing in only one sector.

## **5.2 Conclusion**

The total investment to total deposit ratio of SCBL is the highest and SBI is the lowest among four joint venture banks. It means SCBL is the most successful to mobilize its deposit on profitable sector and SBI is not able to do so. NABIL has also a good ratio but BOKL are not so much satisfiable.

The total loan and advance to total deposit ratio of SBI, BOKL are the quite better than NABIL and SCBL. It means SBI and BOKL are more successful to use its deposit on loan and advance and NABIL has the moderate condition. But the loan and advance to deposit ratio of SCBL is very poor. It is not able to make healthy ratio. The return on total assets ratio of the SCBL is highest and NABIL are moderate position but the BOKL and SBI are the weakest position and BOKL and SBI are also a poor bank in this ratio among the other banks during the study period. The investment of share and debenture to total outside investment ratio of the BOKL is highest and SCBL is the smallest investment of share and debenture of other companies. NABIL has the highest portion and SBI has lowest portion of investment.

Coefficient of variance of investment to total deposit ratio of SBI is highest among four joint venture banks. i.e. 116.02% higher ratio is indicate that less consistent which is not effective to mobilize the total investment and SCBL is the less CV i.e. 45.98% so it is clear that SCBL is most successful. Coefficient of variance of the loan and advance to total deposit ratio of SCBL Ltd. is highest i.e. 16.84 it indicate that less consistent NABIL has lowest CV i.e. 6.96 NABIL bank is more consistent and other two banks are

moderate consistent. CV of return on total assets ratio of SCBL has highest and SBI has lowest CV. It show that SBI is successful bank among four joint venture banks.

According to trend analysis, it shows that the total investment and total deposit of joint venture bank's are in increasing trend. SCBL focuses in investing its fund on share and government securities and providing very high portion of fund in private sectors. NABIL bank focused its investment on government bond and SCBL focuses on private sector.

SCBL has investing very high amount of fund on government securities NABIL has the investing very high amount on share and debenture. It is the greatest investor on government securities and SBI has the smallest investment. Similarly, on the share and debenture of other companies, NABIL has the highest portion and SBI has the lowest portion of investment.

Investment on loan and advances is also the NABIL has higher and BOKI has the smallest. Expected rate of return of all joint venture banks, which are taken as sample has higher than market expected rate of return.

NABIL bank has the highest expected rate of return and SBI has the lowest return. So investor can get the highest rate of return in NABIL bank, but only expected rate of return can not gives appropriate comparison between the assets.

Coefficient of variation is the ratio of risk of per unit expected return. So investor should decide to invest by observing the CV. Where SBI and NABIL have the highest CV and concluded as most risky assets.

Correlation coefficient measures the degree of relationship between two stocks. Correlation coefficient always lies between -1 to +1 value of +1 represent the perfectly positively correlation and -1 represents the perfectly negatively correlated with the market.

SCBL is the highest risk among the four joint venture bank but it is not higher than market risk which is lower than 1 and other three banks are the lowest risk amount. It has very nominal risk than market.

According to sharp portfolio performance, portfolio between BOKL has the best performance, as it has highest risk premium at per unit risk and NABIL has the worst performance as it has the lowest risk premium at per unit at total risk.

In conclusion, NABIL Bank Ltd. is the best bank among four joint venture banks due to various ratio proved above. SBI and BOKL least performance among four joint venture banks. We conclude that NABIL and SCBL are the most successful in Comparison to the other two banks.

### **5.3 Recommendations**

Based on the all study and conclusion following suggestion can be given in recommendation and subjection.

- ) The mean investment to total deposit ratio of BOKL is the lowest among four banks and the ratio of SBI also not so good. So they should have increased the investment in different newly productive sector.
- ) SBI has good investment on loan and advance and share and debenture but it has necessary to increase an investment on government securities.
- ) SCBL has to maintain the highest return on assets and it ratio also increase the investment on government securities.
- ) BOKL has the lowest return on assets, so it has to mobilize its resources on more profitable area. It has also a lower investment portion on loan and advance, so to earn more profit it has to increase investment on more secured and returnable loan and advances.
- ) The return on investment of SBI has also not good so it has to mobilize its resource with a optimization technique. SBI has to increase it's investment on government securities and share and debenture.

- ) Expected rate at return from BOKL is highest among the sample study, so it is suggested to invest in BOKL bank's stock and among them SCBL has lowest standard deviation.
- ) Expected rat of return from all banks is greater than required rate of return so it is suggested to purchase the stock of JVBS that will beneficial in future.
- ) In this growing time competition on banking sector, the activities of the bank should be customer oriented. It should strengthen and active in marketing and retaining customer for this purpose, banks should develop an "innovative approach to the bank marketing" and formulate new strategies of serving customers in a more convenient and satisfactory.

## Appendix-1

### a) Investment on share and debenture

FY	NABIL	SCB	NIBL	BKL	SBI
96/97	9.10	6.00	6.50	-	3.00
97/98	9.10	6.00	7.50	3.00	3.00
98/99	9.73	6.00	7.50	3.00	3.00
99/00	9.73	6.00	7.50	18.00	8.57
00/2001	16.51	11.20	12.70	8.20	8.94
2001/02	16.12	11.20	12.70	8.20	8.94
2002/03	18.82	11.20	12.70	25.00	17.89
2003/04	22.22	11.20	13.90	38.01	17.84
2004/05	22.22	11.20	13.90	38.01	17.89
2005/06	22.22	11.20	13.90	22.81	17.89
Total	155.77	91.2	108.3	164.23	92.12
Avg	15.58	9.21	164.23	18.25	9.21

### b) Investment on loan and advance:

FY	NABIL	SCB	NIBL	BKL	SBI
96/97	3192.73	2395.59	1209.89	171.55	603.29
97/98	3946.25	2798.73	1536.92	972.55	1143.00
98/99	4205.65	3262.89	1575.29	1177.36	1672.72
99/00	4891.79	4027.98	1566.55	1145.51	2314.98
00/2001	5396.82	3970.65	1298.33	1806.41	2905.26
2001/02	6902.19	4658.17	1984.24	2939.21	3502.26
2002/03	7993.28	5660.80	2318.91	4210.88	4101.49
2003/04	7135.54	5248.36	2518.06	4324.77	4238.79
2004/05	7454.26	5574.06	5648.03	4494.45	4424.10
2005/06	7953.76	6322.85	6917.80	5336.97	5258.50
Total	59072.7	43920.02	26574.02	26579.66	28964.39
Avg	5907.23	4392.00	2657.40	2657.9	2896.44

c) Return on loan and advance:

FY	NABIL	SCB	NIBL	BKL	SBI
96/97	12.02	12.19	14.69	1.70	9.09
97/98	13.89	13.91	15.22	11.24	10.07
98/99	14.99	14.75	17.90	15.24	11.86
99/00	14.37	12.80	17.24	16.47	11.82
00/2001	12.24	14.27	16.60	12.49	11.28
2001/02	10.47	11.33	9.96	11.23	10.69
2002/03	10.59	9.86	9.88	9.50	8.96
2003/04	11.23	10.31	10.27	10.03	8.49
2004/05	10.41	10.11	7.47	9.68	9.46
2005/06	9.58	8.83	9.58	8.48	8.86
Total	119.79	118.36	127.91	106.06	100.58
Avg	11.98	11.84	12.79	10.61	10.06

d) Total Investment:

FY	NABIL	SCB	NIBL	BKL	SBI
96/97	412.62	1537.49	11.00	-	32.41
97/98	1432.48	1831.05	80.36	22.37	374.38
98/99	1770.07	2288.93	119.30	190.29	396.82
99/00	954.15	1031.50	17.50	112.78	681.59
00/2001	1420.36	2681.07	102.70	119.86	202.58
2001/02	1250.94	3349.87	12.69	151.63	201.79
2002/03	7704.31	9559.17	1970.28	419.82	373.63
2003/04	8199.51	9275.88	1822.16	667.46	599.05
2004/05	6031.17	10357.68	1705.24	1816.15	1207.28
2005/06	5838.07	11360.33	3864.48	2477.41	1907.52
Total	35011.67	53272.98	9703.71	5977.76	5977.05
Avg	3501.17	5327.30	970.37	664.20	597.71

e) Total Deposit:

FY	NABIL	SCB	NIBL	BKL	SBI
96/97	5354.15	5519.44	1527.45	329.98	714.84
97/98	7089.46	6047.76	1850.70	1281.75	1624.59
98/99	7752.28	7623.16	2104.23	1714.37	2358.91
99/00	8737.76	8530.02	2582.21	1773.87	3744.51
00/2001	9464.28	11165.16	2438.89	2564.83	4380.03
2001/02	12779.51	12565.49	2983.28	4196.41	4535.73
2002/03	15839.01	15430.05	4256.21	5724.13	6612.29
2003/04	15506.43	15835.75	4174.76	5723.29	5572.47
2004/05	13447.65	18755.64	7922.75	6170.70	6522.82
2005/06	14119.03	21161.46	11524.67	7741.64	7198.32
Total	110089.56	122633.93	41365.15	37220.97	43264.5
Avg	11008.96	12263.39	4136.52	3722.10	4326.45

f) Net profit of different CB's:

FY	NABIL	SCB	NIBL	BKL	SBI
96/97	164.48	151.11	61.40	-7.93	7.37
97/98	173.91	239.24	82.91	10.33	37.89
98/99	177.11	248.11	91.24	-5.14	44.92
99/00	174.79	292.37	93.84	-19.53	58.98
00/2001	266.49	359.45	45.69	44.46	16.76
2001/02	329.10	392.59	72.66	70.73	50.06
2002/03	291.38	430.83	56.41	65.35	12.49
2003/04	271.64	479.21	57.11	9.27	40.84
2004/05	416.25	506.95	116.82	82.13	48.75
2005/06	455.32	537.80	152.67	127.48	60.68
Total	2720.47	3637.66	830.75	377.15	378.74
Avg	272.05	363.77	83.05	37.72	37.87



G) Total Assets:

FY	NABIL	SCB	NIBL	BKL	SBI
96/97	6354.46	6523.67	1988.12	401.87	890.73
97/98	8415.77	7983.75	2446.79	1380.15	1852.65
98/99	9592.17	9921.89	2725.42	1891.31	2638.14
99/00	11001.28	10256.17	3322.26	2002.90	4114.03
00/2001	11592.10	13016.97	3106.15	2879.28	4808.79
2001/02	15024.20	16832.24	3796.70	4678.95	5106.58
2002/03	18367.15	19357.20	5127.36	6409.38	7284.79
2003/04	17629.25	18443.10	4973.89	6356.64	7021.14
2004/05	16562.61	21000.50	9014.24	7444.81	7566.33
2005/06	16745.61	23642.06	13255.50	9496.35	8440.40
Total	131284.6	146977.55	49756.43	42914.64	49723.58
Avg	7697.25	7666.57	3627.79	3368.94	3648.85

h) Total outside investment (assets):

FY	NABIL	SCB	NIBL	BKL	SBI	CB <sub>s</sub>
96/97	3852.25	4163.66	1354.51	219.54	641.60	1023.56
97/98	5748.97	4861.82	1746.46	1056.56	1549.69	14963.50
98/99	640.46	5860.58	1828.71	1412.55	2115.61	17623.91
99/00	6178.22	5285.08	1690.97	1290.65	3045.15	17490.08
00/2001	7209.29	6752.70	1513.93	1983.25	3165.61	21624.77
2001/02	8585.70	8207.04	2083.37	3239.29	3761.20	25876.57
2002/03	16028.75	15322.31	4399.30	467.09	4562.04	44988.49
2003/04	1563.41	14639.89	4386.58	5281.16	4898.30	44843.34
2004/05	13787.12	16053.50	7477.38	6358.85	5676.00	49352.85
2005/06	14026.06	17770.57	10992.61	8124.11	7051.18	57964.53
Total	97460.23	98917.15	37473.82	33642.02	36466.38	295751.6
Avg	9746.02	9891.72	3747.38	3364.20	3646.64	30495.96

**Appendix -2**  
**Trend Value**  
**NABIL**

Year	(t) and investment (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	3608.35	-4.5	20.25	(16237.575)
97/98	5378.73	-3.5	12.25	(18825.555)
98/99	5975.72	-2.5	6.25	(14939.3)
99/00	5845.94	-1.5	2.25	(8768.91)
00/2001	6817.18	-0.5	0.25	(3408.59)
2001/2002	7153.13	0.5	0.25	3576.56
2002/2003	15697.59	1.5	2.25	23546.38
2003/2004	15335.05	2.5	6.25	38337.62
2004/2005	13485.44	3.5	12.25	47199.04
2005/2006	13789.71	4.5	20.25	62053.695
	y=93086.8	0	X <sup>2</sup> = 82.5	xy= 1123533.365

$$a = \frac{y}{n} = \frac{93.86.8}{10} = 9308.68$$

$$b = \frac{xy}{x^2} \times \frac{284092.25}{82.5} = 1364.04$$

**NABIL**

Year	Deposit (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	5354.15	-4.5	20.25	-24093.67
97/98	7089.47	-3.5	12.25	-24813.145
98/99	7752.23	-2.5	6.25	-19380.57
99/00	8737.77	-1.5	2.25	-13106.65
00/2001	9464.28	-0.5	0.25	-4732.14
2001/2002	12779.51	0.5	0.25	6389.755
2002/2003	15839.61	1.5	2.25	23758.51
2003/2004	15506.43	2.5	6.51	38766.075
2004/2005	13447.66	3.5	12.25	47066.81
2005/2006	13789.71	4.5	20.25	62053.69
	y=109760.22	0	X <sup>2</sup> = 82.5	xy= 91908.67

$$a = \frac{y}{n} = \frac{109760.22}{10} = 10976.022$$

$$b = \frac{xy}{x^2} \times \frac{91908.687}{82.5} = 1114.04$$

### BOKL

Year	Loan & Investment (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	171.55	-4.5	20.25	-771.975
97/98	994.92	-3.5	12.25	-3482.22
98/99	1367.65	-2.5	6.25	-3419.13
99/00	1258.29	-1.5	2.25	-1887.44
00/2001	1926.27	-0.5	0.25	-963.135
2001/02	3090.84	0.5	0.25	1545.42
2002/03	4630.7	1.5	2.25	6946.05
2003/04	4992.23	2.5	6.25	12480.58
2004/05	6310.6	3.5	12.25	22087.1
2005/06	7814.38	4.5	20.25	35164.71
Total	y=32557.43	0	X <sup>2</sup> = 82.5	xy= 67699.97

$$a = \frac{y}{n} = \frac{32557.43}{10} = 3255.74$$

$$b = \frac{xy}{x^2} X = \frac{67699.97}{82.5} = 820.61$$

Year	Deposit (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	329.98	-4.5	20.25	-1484.91
97/98	1281.75	-3.5	12.25	-4486.13
98/99	1714.37	-2.5	6.25	-4285.93
99/00	1773.87	-1.5	2.25	-2660.81
00/2001	2564.83	-0.5	0.25	-1282.42
2001/02	4196.41	0.5	0.25	2098.205
2002/03	5724.13	1.5	2.25	8586.195
2003/04	5723.29	2.5	6.25	14308.23
2004/05	6170.71	3.5	12.25	21597.49
2005/06	7741.65	4.5	20.25	34837.43
Total	y=37220.99	0	X <sup>2</sup> = 82.5	xy= 67227.36

$$a = \frac{y}{n} = \frac{37220.99}{10} = 3722.10$$

$$b = \frac{xy}{x^2} X = \frac{67227.36}{82.5} = 814.87$$

### SBI

Year	Loan and investment (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	606.69	-4.5	20.25	-2730.11
97/98	1517.38	-3.5	12.25	-5310.83
98/99	2069.54	-2.5	6.25	-5173.85
99/00	2996.58	-1.5	2.25	-4494.87
00/2001	3107.81	-0.5	0.25	-1553.91
2001/02	3704.05	0.5	0.25	1852.025
2002/03	4114.40	1.5	2.25	6171.6
2003/04	4837.85	2.5	6.25	12094.63
2004/05	5631.38	3.5	12.25	19709.83
2005/06	6966.02	4.5	20.25	31347.09
Total	y=35551.7	0	X <sup>2</sup> = 82.5	xy= 51911.61

$$a = \frac{y}{n} = \frac{35551.7}{10} = 3555.17$$

$$b = \frac{xy}{x^2} X = \frac{51911.61}{82.5} = 629.23$$

Year	Deposit (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	714.84	-4.5	20.25	-3216.78
97/98	1624.60	-3.5	12.25	-5686.1
98/99	2358.91	-2.5	6.25	-5897.28
99/00	3744.51	-1.5	2.25	-5616.77
00/2001	4380.02	-0.5	0.25	-2190.01
2001/02	4535.73	0.5	0.25	2267.865
2002/03	6612.29	1.5	2.25	9918.435
2003/04	5572.47	2.5	6.25	13931.18
2004/05	6522.82	3.5	12.25	22829.87
2005/06	7198.33	4.5	20.25	32392.49
Total	y= 43264.52	0	X <sup>2</sup> = 82.5	xy= 58732.9

$$a = \frac{y}{n} = \frac{43264.52}{10} = 4326.45$$

$$b = \frac{xy}{x^2} X = \frac{58732.9}{82.5} = 711.91$$

### SCBL

Year	Loan and investment (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	3933.09	-4.5	20.25	-17698.9
97/98	4629.78	-3.5	12.25	-16204.2
98/99	5551.76	-2.5	6.25	-13879.4
99/00	5059.48	-1.5	2.25	-7589.22
00/2001	6651.73	-0.5	0.25	-3325.87
2001/02	8008.04	0.5	0.25	4004.02
2002/03	15219.98	1.5	2.25	22829.97
2003/04	14524.24	2.5	6.25	36310.6
2004/05	15790.26	3.5	12.25	55265.91
2005/06	17683.18	4.5	20.25	79574.31
<b>Total</b>	<b>y = 97051.54</b>	<b>0</b>	<b>X<sup>2</sup> = 82.5</b>	<b>xy = 139287.2</b>

$$a = \frac{y}{n} = \frac{97051.54}{10} = 9705.15$$

$$b = \frac{xy}{x^2} = \frac{139287.2}{82.5} = 1688.32$$

### SCBL

Year	Deposit (y)	t-2001.5 (x)	X <sup>2</sup>	Xy
96/97	5519.44	-4.5	20.25	-24837.5
97/98	6047.77	-3.5	12.25	-21167.2
98/99	7623.16	-2.5	6.25	-19057.9
99/00	8530.03	-1.5	2.25	-12795
00/2001	11165.17	-0.5	0.25	-5582.59
2001/02	12568.49	0.5	0.25	6284.245
2002/03	15430.05	1.5	2.25	23145.08
2003/04	15835.75	2.5	6.25	39589.38
2004/05	18755.63	3.5	12.25	65644.71
2005/06	21161.44	4.5	20.25	95226.48
<b>Total</b>	<b>y = 122636.9</b>	<b>0</b>	<b>X<sup>2</sup> = 82.5</b>	<b>xy = 146449.7</b>

$$a = \frac{y}{n} = \frac{122636.9}{10} = 12263.69$$

$$b = \frac{xy}{x^2} = \frac{146449.72}{82.5} = 1775.15$$

### Appendix-3

#### Consolidated B/S of the NABIL Bank Ltd. As on Mid-Jul

S.N	Particular	1996/097	1997/1998	1998/099	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
	<b>Capital &amp; Liabilities</b>										
1	Share Capital	491.65	491.65	491.65	491.65	392.80	392.80	392.80	261.70	130.85	130.85
2	Reserve Fund	990.03	822.53	654.77	623.12	545.67	468.38	398.18	349.99	280.40	184.33
3	Borrowings	229.66	961.46	417.30	0	285.20	190.22	0	136.75	0	0
4	Deposits	14119.03	13447.66	15506.43	15839.01	12779.51	9464.28	8737.77	7752.23	7089.47	5354.15
5	Bills Payable	173.50	108.94	67.75	69.70	38.07	82.99	50.42	37.97	43.88	28.99
6	Others	741.61	730.37	491.34	1343.67	982.96	1022.44	1422.12	1053.48	871.17	656.15
	<b>Total Liabilities</b>	<b>16745.48</b>	<b>16562.61</b>	<b>17629.24</b>	<b>18367.15</b>	<b>15024.21</b>	<b>11592.11</b>	<b>11001.29</b>	<b>9592.12</b>	<b>8415.77</b>	<b>6354.47</b>
	<b>Assets</b>										
1	Cash Balance	286.89	187.78	318.16	208.48	169.20	232.95	203.56	239.30	234.78	
2	Bank Balance	683.60	957.00	733.66	604.42	715.26	434.74	920.80	612.59	558.61	909.80 j
3	Money at call	918.73	670.20	313.68	522.55	4631.83	3214.05	2619.98	1659.63	1328.50	928.76
4	Investment	5835.95	6031.18	8199.51	7704.31	1250.94	1420.36	954.15	1770.07	1432.48	412.62
5	Bills purchased and discount	236.23	301.69	302.36	331.16	432.57	392.11	332.29	430.74	370.25	246.90
6	Loans, advance and overdraft	7953.76	7454.26	7135.54	7993.28	6902.19	5396.82	4891.79	4205.65	3946.25	3195.73
7	Fixed assets	338.13	251.92	237.64	235.12	219.19	205.59	189.44	124.64	95.20	59.31
8	Others	492.20	708.61	671.02	767.83	498.76	332.23	859.89	585.29	445.19	369.57
	<b>total</b>	<b>16745.49</b>	<b>16562.64</b>	<b>17629.25</b>	<b>18367.15</b>	<b>15024.23</b>	<b>11592.1</b>	<b>11001.29</b>	<b>9592.17</b>	<b>8415.75</b>	<b>6357.47</b>

**(b) Consolidated B/S of the SCBL Bank Ltd. As on Mid-Jul**

S.N	Particular	1996/097	1997/1998	1998/099	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
	Capital & Liabilities										
1	Share Capital	374.64	339.55	339.55	339.55	339.55	339.55	225.57	150.00	150.00	100.00
2	Reserve Fund	1121.10	1029.36	895.93	672.83	675.30	618.86	653.28	658.23	501.68	443.39
3	Borrowings	78.28	79.16	684.72	1666.71	2430.21	190.08	344.55	997.62	861.93	123.62
4	Deposits	21161.44	18755.63	15835.75	15430.05	12568.49	11165.17	8530.03	7632.16	6047.77	5519.44
5	Bills Payable	59.02	54.84	51.40	35.21	25.99	41.60	21.77	15.84	8.44	9.55
6	Others	847.57	652.42	635.76	1212.85	792.71	661.71	480.98	477.03	413.93	327.66
	Total Liabilities	23642.05	20910.96	18443.11	19357.2	16832.25	13016.97	10256.18	9921.88	7983.75	6523.66
	Assets										
1	Cash Balance	187.70	198.76	257.84	187.66	193.57	213.35	304.03	201.97	149.52	159.95
2	Bank Balance	1832.46	1313.55	567.42	773.39	826.89	612.80	436.31	769.25	552.24	629.23
3	Money at call	2218.60	1657.91	2061.96	2612.01	7243.16	5175.93	3945.95	2672.64	2151.59	1286.15
4	Investment	11360.33	10216.20	9275.88	9559.18	3349.87	2681.08	1031.50	2288.93	1831.05	1537.50
5	Bills purchased and discount	87.39	121.76	1154.64	102.33	199.00	100.98	225.60	308.82	323.05	230.58
6	Loans, advance and overdraft	6322.85	5574.06	5248.36	5660.80	4658.17	3970.65	4027.98	326.83	2798.73	2395.59
7	Fixed assets	136.21	191.71	101.07	121.81	170.72	143.57	161.57	143.11	101.98	100.25
8	Others	149349	1636.02	814.92	340.02	190.86	118.63	132.24	274.33	166.60	184.42
	other	171494.54	20909.97	18443.09	193547.2	16832.24	13016.99	10256.18	9921.88	7983.76	6523.67

(c) **Consolidated B/S of the BOKL Bank Ltd. As on Mid-Jul**

S.N	Particular	1996/097	1997/1998	1998/099	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
	Capital & Liabilities										
1	Share Capital	463.58	463.58	463.58	233.65	227.63	90.00	90.00	90.00	67.50	42.00
2	Reserve Fund	187.16	115.55	56.61	41.62	26.21	10.57	6.66	3.38	3.27	0.07
3	Borrowings	912.15	498.24	0	100.00	0	50.00	0	0	0	0
4	Deposits	7741.65	6170.71	5723.29	5724.13	4196.41	2564.83	1773.87	1714.37	1281.75	329.98
5	Bills Payable	38.71	35.14	12.57	9.94	9.28	12.44	1.23	0.87	1.27	0.25
6	Others	153.09	161.59	100.61	300.04	219.44	151.45	132.13	82.69	26.37	29.56
	Total Liabilities	9496.34	7444.81	6356.66	6409.38	1678.97	2879.29	2003.89	1891.31	1380.16	401.86
	Assets										
1	Cash Balance	139.22	157.4	193.07	181.72	118.71	72.00	106.08	109.23	61.68	10.55
2	Bank Balance	643.66	535.31	490.58 127.39	953.06	519.08	246.09	395.21	187.65	200.49	122.31
3	Money at call	272.32	30.35	667.46	292.00	514.63	441.47	47.29	86.75	0	0
4	Investment	2477.41	1816.15	288.93	419.82	151.63	119.86	112.78	190.29	22.37	0
5	Bills purchased and discount	309.73	48.25	4324.77	45.40	148.423	56.99	32.36	44.91	61.63	47.99
6	Loans, advance and overdraft	5336.97	4494.45	94.22	4210.88	2939.21	1804	1145.51	1177.36	972.55	171.55
7	Fixed assets	83.63	93.64	170.24	102.01	53.04	41.63	38.45	33.29	29.77	24.55
8	Others	233.41	269.26	170.24	204.50	234.24	94.83	126.22	61.85	31.66	24.85
	other	9496.35	7444.81	6356.66	6409.39	4678.96	2879.29	2003.9	1891.33	1380.15	102.07



(d) Consolidated B/S of the SBI Bank Ltd. As on Mid-Jul

S.N	Particular	1996/097	1997/1998	1998/099	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
	Capital & Liabilities										
1	Share Capital	426.88	425.16	424.89	143.94	119.95	119.95	119.95	119.95	119.98	119.87
2	Reserve Fund	199.76	144.69	135.45	82.45	77.64	66.90	102.66	57.25	29.42	13.57
3	Borrowings	117.18	65.83	558.79	0	0	0	0	0	0	20.00
4	Deposits	7198.33	6522.82	5572.47	6612	4535.73	4380.02	3744.51	2358.91	1624.60	714.84
5	Bills Payable	0	0	0.09	6.15	7.45	4.38	4.63	1.68	0.48	0.737
6	Others	498.26	407.83	329.44	439.77	365.80	237.54	142.29	100.35	79.18	21.70
	Total Liabilities	8440.41	7566.33	7021.13	72384.6	5106.57	4808.79	4114.04	2638.14	1853.66	890.717
	Assets										
1	Cash Balance	161.22	269.66	166.62	148.52	138.56	114.37	56.44	80.88	22.48	10.79
2	Bank Balance	703.20	1063.88	1453.34	1796.62	751.46	1243.43	705.12	311.14	197.92	192.16
3	Money at call	0	0	0	390.00	120.00	0	0	0	0	0
4	Investment	1907.52	1207.28	599.06	373.63	201.79	202.58	618.60	396.82	374.38	32.41
5	Bills purchased and discount	85.16	44.62	60.46	86.92	57.15	57.77	48.58	46.07	32.32	5.90
6	Loans, advance and overdraft	5058.50	4424.10	4238.79	4104.49	3502.26	2905.23	2314.98	1672.72	1143.00	603.28
7	Fixed assets	62.35	71.03	65.59	68.28	63.52	55.88	57.51	39.29	28.90	16.70
8	Others	462.45	485.76	437.29	319.13	271.84	229.50	249.82	91.22	54.66	29.48
	other	8440.4	7566.33	7021.15	7287.59	5106.58	4808.76	4114.05	2638.14	1853.66	890.72

**Appendix-4 (A)**

**Calculation of correlation and regression equation of  
X<sub>1</sub>, on X<sub>2</sub> and X<sub>3</sub> of NABIL**

Years	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>1</sub> X <sub>2</sub>	X <sub>2</sub> X <sub>3</sub>	X <sub>1</sub> X <sub>3</sub>	X <sub>1</sub> <sup>2</sup>	X <sub>2</sub> <sup>2</sup>	X <sub>3</sub> <sup>2</sup>
1996/097	9.85	22.83	64.2	224.87	1465.68	632.37	97.02	521.21	4121.64
1997/098	11.59	10.92	29.7	126.56	324.32	344.22	134.34	119.24	882.09
1998/099	17.30	15.01	23.4	259.67	351.23	404.82	299.29	225.30	547.56
1999/00	12.19	9.79	18	119.34	176.22	219.42	148.59	95.84	324
2000/01	15.59	48.64	18.48	758.29	898.86	288.10	243.04	2365.85	341.51
2001/02	21.54	52.88	14.5	1139.3	766.76	312.33	463.97	2796.3	210.25
2002/03	12.51	44.85	9.85	561.07	441.77	123.22	156.50	2011.52	97.022
2003/04	9.72	41.33	12.44	401.72	514.145	120.91	94.47	1708.16	154.75
2004/05	22.31	45.55	16.86	1016.2	312.47	376.146	497.73	2074.08	284.25
2005/06	22.35	52.36	16.62	1170.24	870.22	371.45	499.52	2741.56	276.22
	X <sub>1</sub> = 154.95	X <sub>2</sub> = 344.16	X <sub>3</sub> = 224.05	X <sub>1</sub> X <sub>2</sub> = 5776.99	X <sub>2</sub> X <sub>3</sub> = 6121.98	X <sub>1</sub> X <sub>3</sub> = 3192.96	X <sub>1</sub> <sup>2</sup> = 2634.04	X <sub>2</sub> <sup>2</sup> = 14659.78	X <sub>3</sub> <sup>3</sup> = 7239.29

$$r_{12} = \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_2^2 - (\sum x_2)^2}}$$

$$= \frac{10 | 5776.94 - 154.95 | 344.96}{\sqrt{10 | 2634.04 - (154.95)^2} \sqrt{10 | 14659.78 - (344.96)^2}}$$

$$= \frac{4441.81}{\sqrt{233.09} \sqrt{28151.7}}$$

$$= 0.548$$

$$r_{13} = \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 3192.96 - 154.95 | 224.05}{\sqrt{10 | 2634.04 - (154.95)^2} \sqrt{10 | 7239.29 - (224.05)^2}}$$

$$= \frac{22786.94}{\sqrt{2330.9} \sqrt{16194.5}}$$

$$= (0.453)$$

$$r_{23} = \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - (\sum x_2)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 6121.98 - 344.36 | 224.05}{\sqrt{10 | 14659.78 - (344.96)^2} \sqrt{10 | 7239.29 - (224.05)^2}}$$

$$= \frac{61219.8 - 77153.85}{\sqrt{28151.7} \sqrt{16194.5}}$$

$$= (0.746)$$

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

$$= \frac{\sqrt{(0.548)^2 + (0.453)^2 - 2(0.548)(0.453)}}{\sqrt{1 - (0.746)^2}}$$

$$= \sqrt{\frac{0.13512}{0.4435}} = 0.551$$

Calculation of multiple regression equation of  $X_1$  on  $X_2$  and  $X_3$  is given by

$$X_1 = a_1 + b_1 X_2 + b_2 X_3 \dots \dots \dots (1)$$

The regression constant  $a_1, b_1$  and  $b_2$  can be obtained by solving following three equations:

$$X_1 = na_1 + b_1 \quad X_2 + b_2 \quad X_2 \dots\dots\dots(i)$$

$$X_1 X_2 \quad X a_1 \quad X_2 + b_1 \quad X_2^2 + b_2 \quad X_2 X_3 \dots\dots\dots(ii)$$

$$X_1 X_3 \quad X a_1 \quad X_3 + b_1 \quad X_2 X_3 \quad \Gamma b_2 \quad X_3^2 \dots\dots\dots(iii)$$

Substituting of Value in Equation (i), (ii) and (iii)

$$10a_1 + 344.16b_1 + 224.05b_2 = 154.95 \dots\dots\dots(iv)$$

$$344.16a_1 + 14659.78b_1 + 6121.98b_2 = 5776.99 \dots\dots(v)$$

$$224.05a_1 + 6121.98b_1 + 7239.21b_2 = 3192.96 \dots\dots\dots(vi)$$

Taking the equation 4 and 5 multiplying equation (iv) by 34.16 and subtract

$$\begin{array}{r} 344.16a_1 + 11844.61b_1 + 7710.90b_2 = 5332.7 \\ 344.16a_1 + 14659.78b_1 + 6121.98b_2 = 5776.99 \\ \hline -2815.17b_1 + 1588.92b_2 = -444.2 \\ \hline 2815.17b_1 - 1588.92b_2 = 444.2 \dots\dots\dots(vii) \end{array}$$

Again, taking the equation (iv) and (vi) Multiplying equation (iv) by 24.405 and subtract

$$\begin{array}{r} 224.05a_1 + 7710.90b_1 + 5019.95b_2 = 3471.65 \\ 224.05a_1 + 6121.98b_1 + 7239.21b_2 = 3192.96 \\ \hline 1588.92b_1 - 2219.4b_2 = 278.69 \dots\dots\dots(viii) \end{array}$$

Taking the equation (vii) and (viii), Multiplying equation (vii) by 1.7717 and subtract

$$\begin{array}{r} 2815.17b_1 - 3932.11b_2 = 493.75 \\ 2815.17b_1 - 1588.92b_2 = 444.2 \\ \hline 2343.19b_2 = 49.53 \\ b_2 = 0.0211 \end{array}$$

Putting the value of  $b_2$  in equation (vii)

$$\begin{aligned} 2815.17b_1 - 1588.92b_2 &= 444.2 \\ \text{or, } 2815.17b_1 - 1588.92 \times 0.0211 &= 444.2 \\ \text{or, } 2815.17b_1 &= 444.2 + 33.526 \\ b_1 &= 0.169 \end{aligned}$$

Putting the value of  $b_1$  and  $b_2$  in equation (iv)

$$\begin{aligned} 10a_1 + 344.16 \times 0.169 + 224.05 \times 0.211 &= 154.95 \\ \text{or, } a_1 &= 96.043/10 \\ a_1 &= 9.60 \end{aligned}$$

Putting the value of  $a_1$ ,  $b_1$  and  $b_2$  in equation 1 we get,

$$X_1 = 9.60 + 0.169 X_2 + 0.0211 X_3$$

**Appendix- (B)**

**Calculation of correlation and regression equation of  
X<sub>1</sub>, on X<sub>2</sub> and X<sub>3</sub> of BOKL**

Years	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>1</sub> X <sub>2</sub>	X <sub>2</sub> X <sub>3</sub>	X <sub>1</sub> X <sub>3</sub>	X <sub>1</sub> <sup>2</sup>	X <sub>2</sub> <sup>2</sup>	X <sub>3</sub> <sup>2</sup>
1996/097	11.27	30.27	10.11	341.14	306.029	113.93	127.01	916.27	102.21
1997/098	10.97	25.97	11.10	284.89	288.26	121.76	120.34	674.44	123.1
1998/099	21.54	10.51	6.36	226.38	66.84	136.99	463.97	110.46	40.44
1999/00	18.02	16.65	4.67	300.03	77.75	84.15	324.72	277.22	21.80
2000/01	16.15	23.63	3.61	381.62	85.30	50.30	260.82	558.37	13.24
2001/02	12.92	9.11	7.33	117.70	66.77	94.70	166.92	82.99	53.72
2002/03	22.33	19.31	11.66	431.19	225.15	260.36	498.62	372.87	135.95
2003/04	20.54	7.84	29.43	161.033	230.75	604.49	421.89	61.46	866.12
2004/05	12.36	16.24	32.0	200.76	519.68	395.52	152.76	236.73	1024
2005/06	23.19	18.35	35.31	425.53	647.93	818.83	537.77	336.72	1246.79
	X <sub>1</sub> = 169.47	X <sub>2</sub> = 177.95	X <sub>3</sub> = 151.58	X <sub>1</sub> X <sub>2</sub> = 2870.27	X <sub>2</sub> X <sub>3</sub> = 2514.44	X <sub>1</sub> X <sub>3</sub> = 2680.98	X <sub>1</sub> <sup>2</sup> = 3074.82	X <sub>2</sub> <sup>2</sup> = 3654.53	X <sub>3</sub> <sup>3</sup> = 3627.48

$$r_{12} = \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_2^2 - (\sum x_2)^2}}$$

$$= \frac{10 | 2870.27 - 169.47 | 177.95}{\sqrt{10 | 3074.82 - (169.47)^2} \sqrt{10 | 3654.53 - (177.95)^2}}$$

$$= \frac{1454.48}{\sqrt{2028.12} \sqrt{4879.1}}$$

$$= -0.462$$

$$r_{13} = \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 2680.98 - 169.47 | 151.58}{\sqrt{10 | 3074.82 - (169.47)^2} \sqrt{10 | 3627.48 - (151.58)^2}}$$

$$= \frac{1121.54}{\sqrt{30748.2} \sqrt{13298.30}}$$

$$= 0.216$$

$$r_{23} = \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - (\sum x_2)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 2514.44 - 177.95 | 151.58}{\sqrt{10 | 3654.53 - (177.95)^2} \sqrt{10 | 3627.48 - (151.58)^2}}$$

$$= \frac{25144.4 - 26973.66}{\sqrt{4879.1} \sqrt{13298.30}}$$

$$= (0.228)$$

$$R_{1.23} = \frac{\sqrt{r_{12}^2 \Gamma r_{13}^2 - 2 r_{12} r_{13} r_{23}}}{\sqrt{1 - r_{23}^2}}$$

$$= \frac{\sqrt{(0.462)^2 \Gamma (0.216)^2 - 2(0.462)(0.216)(0.227)}}{\sqrt{1 - (0.227)^2}}$$

$$= \sqrt{\frac{0.214695}{0.9485}} = 0.475$$

Calculation of multiple regression equation of  $X_1$  on  $X_2$  and  $X_3$  is given by

$$X_1 = a_1 + b_1 X_2 + b_2 X_3 \dots \dots \dots (1)$$

The regression constant  $a_1, b_1$  and  $b_2$  can be obtained by solving following three equations:

$$X_1 = na_1 + b_1 \sum X_2 + b_2 \sum X_3 \dots \dots \dots (i)$$

$$X_1 X_2 X a_1 \quad X_2 + b_1 \quad X_2^2 + b_2 \quad X_2 X_3 \dots\dots\dots(ii)$$

$$X_1 X_3 X a_1 \quad X_3 + b_1 \quad X_2 X_3 \Gamma b_2 \quad X_3^2 \dots\dots\dots(iii)$$

Substituting of Value in Equation (i), (ii) and (iii)

$$10a_1 + 177.95b_1 + 151.58b_2 = 169.47 \dots\dots\dots(iv)$$

$$177.95a_1 + 3654.53b_1 + 2514.44b_2 = 2870.27 \dots\dots(v)$$

$$151.58a_1 + 2514.44b_1 + 3627.48b_2 = 2680.98 \dots\dots\dots(vi)$$

Taking the equation (iv) and (v) multiplying equation (iv) by 17.795 and subtract

$$\begin{array}{r} 177.95a_1 + 3166.62b_1 + 2697.36b_2 = 3015.71 \\ 177.95a_1 + 3654.53b_1 + 2514.44b_2 = 2870.27 \\ \hline -487.91b_1 + 182.92b_2 = 145.40 \dots\dots\dots(vii) \end{array}$$

Again, taking the equation (iv) and (vi) Multiplying equation (iv) by 15.158 and subtract

$$\begin{array}{r} 151.58a_1 + 2697.36b_1 + 2297.64b_2 = 2568.8 \\ 151.58a_1 + 2514.44b_1 + 3627.48b_2 = 2680.98 \\ \hline 182.92b_1 - 1329.84b_2 = -112.5 \dots\dots\dots(viii) \end{array}$$

Taking the equation (vii) and (viii), Multiplying equation (vii) by 2.667 and subtract

$$\begin{array}{r} -487.91b_1 + 182.92b_2 = 145.40 \\ 487.91b_1 - 3547.08b_2 = -300.07 \\ \hline -3364.16b_2 = -154.67 \\ b_2 = \frac{154.67}{3364.16} = 0.0459 \end{array}$$

Putting the value of  $b_2$  in equation (vii)

$$-487.91b_1 + 182.92 \times 0.0459 = 145.40$$

$$\text{or, } -487.91b_1 = 145.40 - 8.396$$

$$b_1 = -0.289$$

Putting the value of  $b_1$  and  $b_2$  in equation (iv)

$$10a_1 + 177.95 \times -0.289 + 151.58 \times 0.0459 = 169.47$$

$$\text{or, } 10a_1 = 169.47 - 6.9575 + 51.42$$

$$a_1 = 26.53$$

Putting the value of  $a_1$ ,  $b_1$  and  $b_2$  in equation 1 we get,

$$X_1 = 26.53 - 0.289X_2 + 0.0459X_3$$

**appendix-4 )C)**  
**Calculation of correlation and regression equation of**  
 **$X_1$ , on  $X_2$  and  $X_3$  of SBI**

Years	$X_1$	$X_2$	$X_3$	$X_1 X_2$	$X_2 X_3$	$X_1 X_3$	$X_1^2$	$X_2^2$	$X_3^2$
1996/097	18.70	16.82	28.24	314.53	474.99	528.08	349.69	282.91	797.49
1997/098	13.43	18.20	30.21	244.42	549.82	405.72	180.36	331.2	912.64
1998/099	41.35	14.63	25.8	604.95	377.45	1066.83	1709.82	214.63	665.64
1999/00	8.40	14.45	10.47	121.38	151.29	87.99	70.56	208.8	109.62
2000/01	9.35	15.65	16.65	146.32	260.57	155.67	87.42	244.92	277.22
2001/02	11.92	11.75	23.63	140.06	277.65	281.66	142.68	138.06	558.37
2002/03	11.93	18.51	19.11	220.82	353.72	227.98	142.32	342.62	365.19
2003/04	19.87	26.50	16.22	526.53	429.83	322.29	394.81	702.25	263.08
2004/05	20.13	30.81	18.31	620.20	564.13	368.58	405.2	949.25	335.258
2005/06	20.30	33.30	22.24	675.99	740.59	451.47	412.09	1108.89	494.61
	$X_1=$ 175.38	$X_2=$ 200.62	$X_3=$ 210.88	$X_1 X_2=$ 3615.2	$X_2 X_3=$ 4180.04	$X_1 X_3=$ 3896.2	$X_1^2=$ 3894.35	$X_2^2=$ 4523.47	$X_3^3=$ 4061.11



$$r_{12} = \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_2^2 - (\sum x_2)^2}}$$

$$= \frac{10 | 3615.2 - 175.38 | 200.62}{\sqrt{10 | 3894.35 - (175.38)^2} \sqrt{10 | 4523.47 - (200.62)^2}}$$

$$= \frac{697.27}{\sqrt{8185.35} \sqrt{4986.32}}$$

$$= 0.152$$

$$r_{13} = \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 3896.2 - 175.38 | 210.88}{\sqrt{10 | 3894.35 - (175.38)^2} \sqrt{10 | 4061.11 - (210.68)^2}}$$

$$= \frac{1977.87}{\sqrt{8185.35} \sqrt{3859.1}} = 0.351$$

$$r_{23} = \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - (\sum x_2)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 4180.04 - 200.62 | 210.88}{\sqrt{10 | 4523.47 - (200.62)^2} \sqrt{10 | 4061.11 - (210.88)^2}}$$

$$= \frac{506.34}{\sqrt{4986.32} \sqrt{3859.21}}$$

$$= 0.115$$

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

$$= \frac{\sqrt{(0.1514)^2 + (0.351)^2 - 2(0.1514)(0.351)(0.115)}}{\sqrt{1 - (0.115)^2}}$$

$$= \frac{\sqrt{0.1339}}{\sqrt{0.9867}} = 0.368$$

Calculation of multiple regression equation of  $X_1$  on  $X_2$  and  $X_3$  is given by

$$X_1 = a_1 + b_1 X_2 + b_2 X_3 \dots \dots \dots (1)$$

The regression constant  $a_1, b_1$  and  $b_2$  can be obtained by solving following three equations

$$X_1 = na_1 + b_1 X_2 + b_2 X_3 \dots \dots \dots (i)$$

$$X_1 X_2 X a_1 \quad X_2 + b_1 \quad X_2^2 + b_2 \quad X_2 X_3 \dots\dots\dots(ii)$$

$$X_1 X_3 X a_1 \quad X_3 + b_1 \quad X_2 X_3 \Gamma b_2 \quad X_3^2 \dots\dots\dots(iii)$$

Substituting of Value in Equation (i), (ii) and (iii)

$$10a_1 + 200.62b_1 + 210.88b_2 = 175.38 \dots\dots\dots(iv)$$

$$200.62a_1 + 4523.47b_1 + 4180.054b_2 = 3615.2 \dots\dots(v)$$

$$210.88a_1 + 4180.04b_1 + 4061.61b_2 = 3896.2 \dots\dots(vi)$$

Taking the equation (iv) and (v) multiplying equation (iv) by 20.062 and subtract

$$\begin{array}{r} 200.62a_1 + 4024.83b_1 + 4230.67b_2 = 3518.47 \\ 200.62a_1 + 4523.47b_1 + 4180.054b_2 = 3615.2 \\ \hline -498.6b_1 + 50.63b_2 = -96.8 \\ 498.6b_1 - 50.63b_2 = 96.8 \dots\dots\dots(vii) \end{array}$$

Again, taking the equation (iv) and (vi) Multiplying equation (iv) by 21.088 and subtract

$$\begin{array}{r} 210.88a_1 + 1230.67b_1 + 4447.03b_2 = 3698.41 \\ 210.88a_1 + 4180.04b_1 + 4061.61b_2 = 3896.2 \\ \hline 50.63b_1 - 385.42b_2 = -197.79 \dots\dots\dots(viii) \end{array}$$

Taking the equation (vii) and (viii), Multiplying equation (vii) by 9.84 and subtract

$$\begin{array}{r} 498.6b_1 - 50.63b_2 = 96.8 \\ 498.6b_1 + 3792.53b_2 = -1946.25 \\ \hline -3843.16b_2 = 2043.05 \\ b_2 = \frac{2043.05}{-3843.16} = -0.531 \end{array}$$

Putting the value of  $b_2$  in equation (vii)

$$-498.6b_1 - 50.63 \times (-0.531) = 96.8$$

$$\text{or, } -198.6b_1 = 96.8 - 26.88$$

$$b_1 = 0.141$$

Putting the value of  $b_1$  and  $b_2$  in equation (iv)

$$10a_1 + 200.62 \times 0.141 + 210.88 \times -0.153 = 175.38$$

$$\text{or, } 10a_1 = 175.38 + 111.97 - 28.08$$

$$a_1 = 25.92$$

Putting the value of  $a_1$ ,  $b_1$  and  $b_2$  in equation 1 we get,

$$X_1 = 25.92 + 0.141X_2 - 0.531X_3$$

**Appendix-4(d)**  
**Calculation of correlation and regression equation of**  
 **$X_1$  on  $X_2$  and  $X_3$  of SCBL**

Years	$X_1$	$X_2$	$X_3$	$X_1 X_2$	$X_2 X_3$	$X_1 X_3$	$X_1^2$	$X_2^2$	$X_3^2$
1996/097	21.31	27.86	26.5	593.69	738.29	564.71	454.11	776.17	702.25
1997/098	23.33	30.28	36.16	706.43	104.9	843.61	544.2	916.87	1307.5
1998/099	34.85	30.03	39.29	1046.54	1179.04	1369.25	1214.52	901.80	1543.70
1999/00	31.56	12.09	42.3	381.56	511.40	1334.9	996.03	146.16	1789.2
2000/01	32.91	24.01	43.5	790.16	1044.43	1431.58	1083.06	576.48	1892.25
2001/02	29.90	26.66	36.26	497.13	966.69	1084.17	894.01	710.75	1314.78
2002/03	28.31	61.95	46.9	1753.80	2905.45	1327.7	801.4	3837.8	2199.6
2003/04	31.32	58.88	38.22	1844.12	2250.39	1197.5	980.94	3466.85	1460.7
2004/05	26.51	55.22	44.51	1463.88	2457.84	1179.96	702.78	3049.24	1981.2
2005/06	36.33	53.68	38.52	1950.19	2067.75	1399.43	1319.86	2881.54	1483.7
Total	$X_1 =$ 296.33	$X_2 =$ 380.31	$X_3 =$ 392.42	$X_1 X_2 =$ 11327.5	$X_2 X_3 =$ 15215.28	$X_1 X_3 =$ 11732.81	$X_1^2 =$ 8990.91	$X_2^2 =$ 15429.89	$X_3^2 =$ 15674.92

$$r_{12} = \frac{N \sum x_1 x_2 - \sum x_1 \cdot \sum x_2}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_2^2 - (\sum x_2)^2}}$$

$$= \frac{10 | 11327.5 - 296.33 \cdot 280.31 |}{\sqrt{10 | 8990.91 - (296.33)^2} \sqrt{10 | 15429.89 - (380.31)^2}}$$

$$= \frac{578.01}{\sqrt{2097.64} \sqrt{9663.21}}$$

$$= 0.128$$

$$r_{13} = \frac{N \sum x_1 x_3 - \sum x_1 \cdot \sum x_3}{\sqrt{N \sum x_1^2 - (\sum x_1)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 11732.81 - 296.33 \cdot 392.42 |}{\sqrt{10 | 8990.91 - (296.33)^2} \sqrt{10 | 15674.92 - (392.42)^2}}$$

$$= \frac{1042.29}{\sqrt{2097.64} \sqrt{2755.8}} = 0.433$$

$$r_{23} = \frac{N \sum x_2 x_3 - \sum x_2 \cdot \sum x_3}{\sqrt{N \sum x_2^2 - (\sum x_2)^2} \sqrt{N \sum x_3^2 - (\sum x_3)^2}}$$

$$= \frac{10 | 15215.28 - 380.31 \cdot 392.42 |}{\sqrt{10 | 15429.89 - (380.31)^2} \sqrt{10 | 15674.92 - (392.42)^2}}$$

$$= \frac{2911.55}{\sqrt{966.21} \sqrt{2755.8}}$$

$$= 0.564$$

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

$$= \frac{\sqrt{(0.128)^2 + (0.433)^2 - 2(0.128)(0.433)(0.564)}}{\sqrt{1 - (0.564)^2}}$$

$$= \frac{\sqrt{0.326137}}{\sqrt{0.681904}} = 0.692$$

Calculation of multiple regression equation of  $X_1$  on  $X_2$  and  $X_3$  is given by

$$X_1 = a_1 + b_1 X_2 + b_2 X_3 \dots \dots \dots (1)$$

The regression constant  $a_1, b_1$  and  $b_2$  can be obtained by solving following three equations

$$X_1 = na_1 + b_1 X_2 + b_2 X_3 \dots \dots \dots (i)$$

$$X_1 X_2 X a_1 \quad X_2 + b_1 \quad X_2^2 + b_2 \quad X_2 X_3 \dots\dots\dots(ii)$$

$$X_1 X_3 X a_1 \quad X_3 + b_1 \quad X_2 X_3 \Gamma b_2 \quad X_3^2 \dots\dots\dots(iii)$$

Substituting of Value in Equation (i), (ii) and (iii)

$$10a_1 + 380.31b_1 + 392.42b_2 = 296.33 \dots\dots\dots(iv)$$

$$380.31a_1 + 15429.89b_1 + 15215.28b_2 = 11327.5 \dots\dots(v)$$

$$392.42a_1 + 15215.28b_1 + 15674.92b_2 = 11732.81 \dots\dots\dots(vi)$$

Taking the equation (iv) and (v) multiplying equation (iv) by 38.031 and subtract

$$\begin{array}{r} 380.31a_1 + 14463.56b_1 + 14924.12b_2 = 11269.72 \\ 380.31a_1 + 15429.89b_1 + 15215.28b_2 = 11327.5 \\ \hline -966.33b_1 - 291.18b_2 = -463.09 \\ 966.33b_1 + 291.18b_2 = 463.09 \dots\dots\dots(vii) \end{array}$$

Again, taking the equation (iv) and (vi) Multiplying equation (iv) by 39.242 and subtract

$$\begin{array}{r} 392.42a_1 + 14924.12b_1 + 15399.34b_2 = 11628.53 \\ 392.42a_1 + 15215.28b_1 + 15674.92b_2 = 11732.81 \\ \hline -291.16b_1 + 275.58b_2 = -104.23 \dots\dots\dots(viii) \end{array}$$

Taking the equation (vii) and (viii), Multiplying equation (vii) by 3.318 and subtract

$$\begin{array}{r} 966.33b_1 + 291.18b_2 = 463.09 \\ 966.33b_1 - 914.37b_2 = 345.83 \\ \hline 1205.53b_2 = 117.26 \end{array}$$

$$b_2 = \frac{117.26}{1205.53} = 0.0972$$

Putting the value of  $b_2$  in equation (vii)

$$966.33b_1 + 291.18 \times 0.0972 = 463.09$$

$$\text{or, } 966.33b_1 = 463.09 - 28.30$$

$$b_1 = 0.4499$$

Putting the value of  $b_1$  and  $b_2$  in equation (iv)

$$10a_1 + 380.31 \times 0.4499 + 392.42 \times -0.0972 = 296.33$$

$$\text{or, } 10a_1 = 296.33 - 171.10 - 38.143$$

$$a_1 = 8.708$$

Putting the value of  $a_1$ ,  $b_1$  and  $b_2$  in equation 1 we get,

$$X_1 = 8.708 + 0.449X_2 + 0.0972X_3$$

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